AT/FP: Applied Gatehouse Design and Entry Control Facilities

"Form Follows Function"

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Don McClarin, PE, AICP & Chris Basham, AIA, AICP
PARSONS

Outline

- The Need
  - Assumptions
  - Priorities
- Design Considerations – “Herding the Cats”
  - Security Processes
  - Design Guidelines
  - Gate Volumes and Lane Capacity
  - Image
  - Components
  - Smart Gates
  - Site Specific Items
  - Funding
- Example
- Design – “Skinning the Cat”
  - AMC Cold Weather Gates Design Charrette
  - Canopy Designs
  - Design Detail – Speed Control
  - Integration of Design Requirements - Evolution
- Design Build +: An Application

The Need

- **Provide recommendations that will improve gate security, personnel safety and reduce traffic congestion, while maintaining access control requirements**
- **Assumptions**
  - **FPCON Bravo+ is the baseline for sustained operations**
  - **The first line of defense is the base perimeter and entry control facilities (ECFs)**
  - **A vehicle-borne bomb is the primary threat**
- **Priorities**
  - **1. Force protection and security**
  - **2. Safety of Security Forces and motorists**
  - **3. Gate capacity and traffic flow**
  - **4. Aesthetics**

Design Considerations
Security Processes - Functions

- **Security**
  - **Traffic management**
    - Time of Day Capacities
    - Rejections and traffic flow
    - Progressive denials
  - **ID Check Stations**
    - Bullet proof protection
    - 2 means of egress
    - Standing/ no sitting
    - Maneuverability for Occupant Interview
    - 2 hr. duty shifts at satellite stations
    - Writing/ shelf surface
  - **Future Security Methods**
    - Future card readers
    - Durability/ maintainability

Design Considerations
Security Processes - Functions

- Provide Area Protection & ID Checker Protection
- Quality of Life
  - Heat (Reasonably warm)
  - Wind
  - Rain/Snow
- Safety
  - Lighting
  - 360 Visibility
  - Traffic Control
  - Curbing
  - Crash Attenuators

Design Considerations
Design Guidelines

- AMC Force Protection Sustainment Team Report, Mar 02
- AMC Entry Control Facilities Design Guidelines, Feb 02
  - Traffic flow
  - Visitor control
  - Vehicle inspection
  - Entry control
  - Security/overwatch provisions
  - Commercial vehicles
- Installation Architectural Compatibility Plan (ACP)
  - Utilize colors, textures, materials as outlined in the ACP
  - Include details that demonstrate each structure as unique or tailored to the installation
- General
  - Manual on Uniform Traffic Control Devices, FHWA
  - Policy on Geometric Design of Highways and Streets, AASHTO
  - Roadside Design Guide, AASHTO

Design Considerations
ECF Design Guide

- Developed with CE and SF
- Segregates solutions between POV and Commercial vehicles
- Concept of progressive entry clearance and denial
- What it says and what it doesn't say – best solution is an installation specific solution
- Aesthetics and Function – Base operating decisions
- Still (always) under development

Design Considerations
ECF Guidelines – Entry Flow

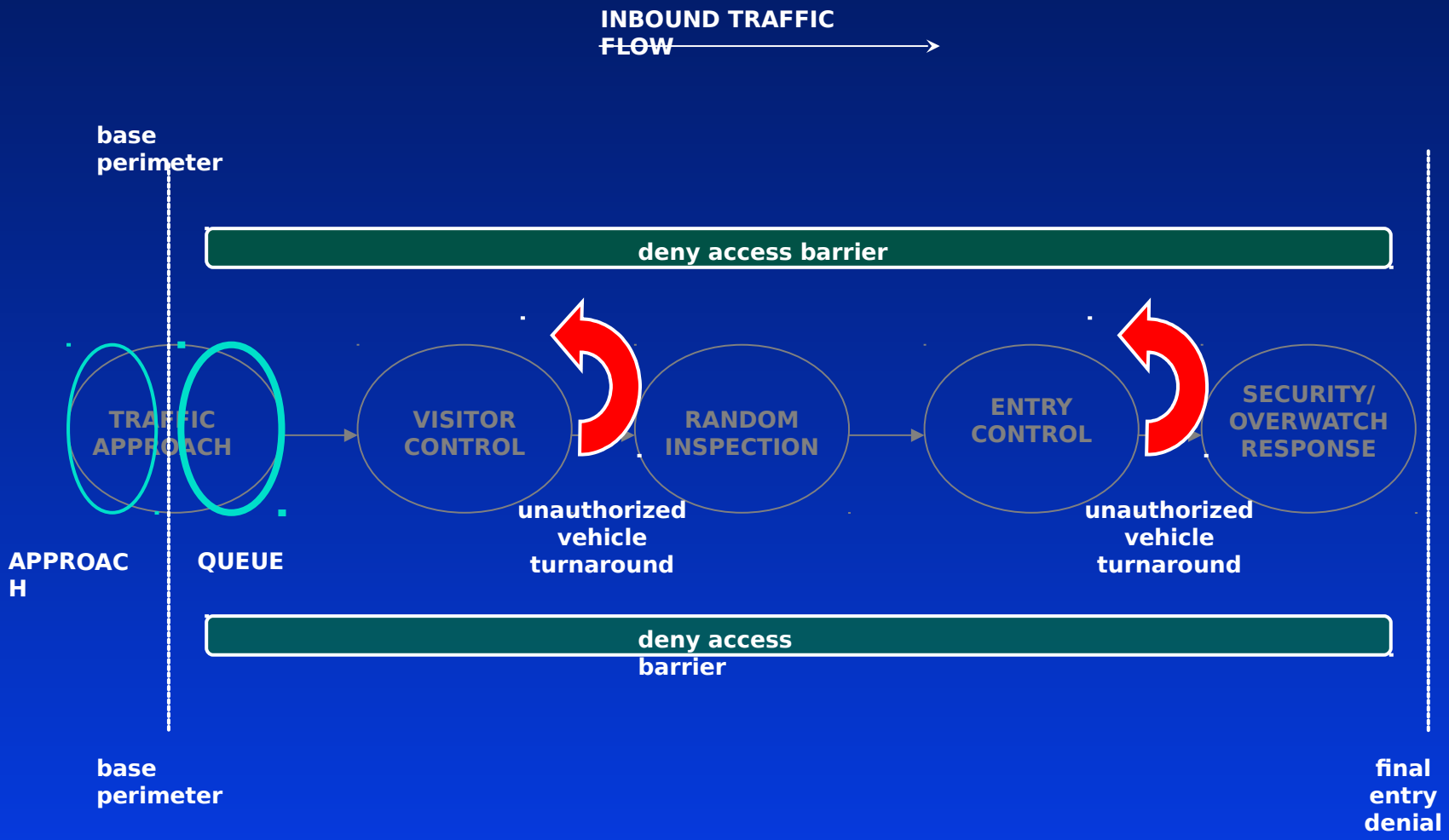


Figure 1. Sequence of ECF Functions

Design Considerations
ECF Guidelines – Visitor's Center

- **Traffic flow**
  - Number of lanes
  - Location of queue
  - Containment
  - Turnaround
- **Visitor control**
  - Exit to outbound access or inspection

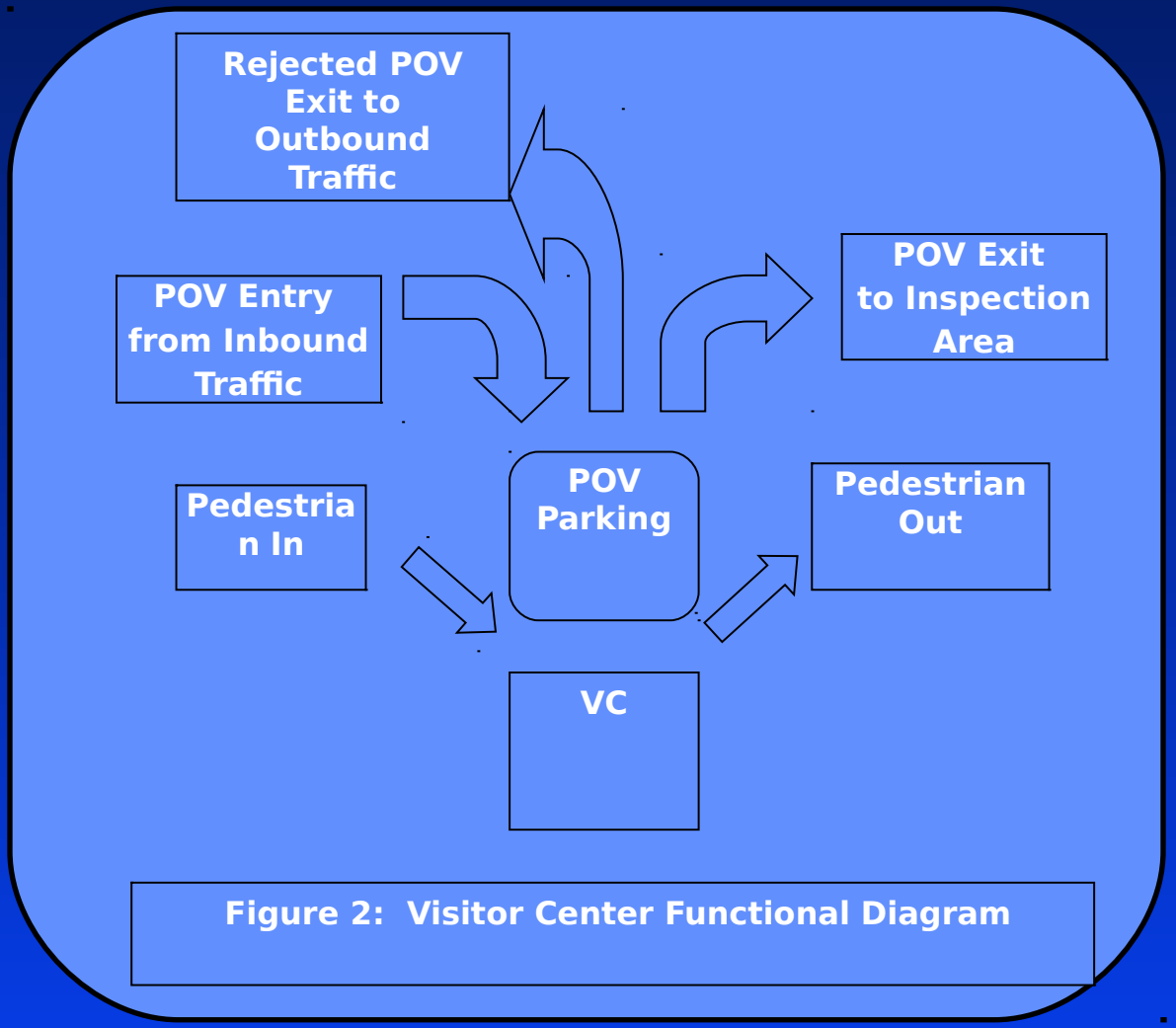


Figure 2: Visitor Center Functional Diagram

Design Considerations
ECF Guidelines – Vehicle Inspection

- Vehicle inspection
  - Random authorized POVs
  - All visitors
  - Enclosure as applicable for climate

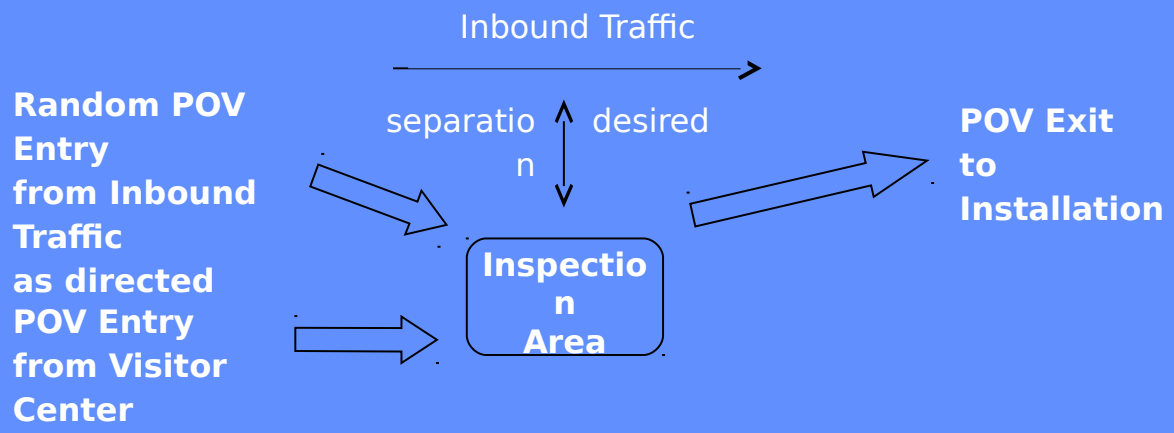


Figure 3: Vehicle Inspection Functional Diagram

Design Considerations
ECF Guidelines – ID Checkpoint

- **Entry control**
  - Tandem processing
  - Canopy, QOL elements

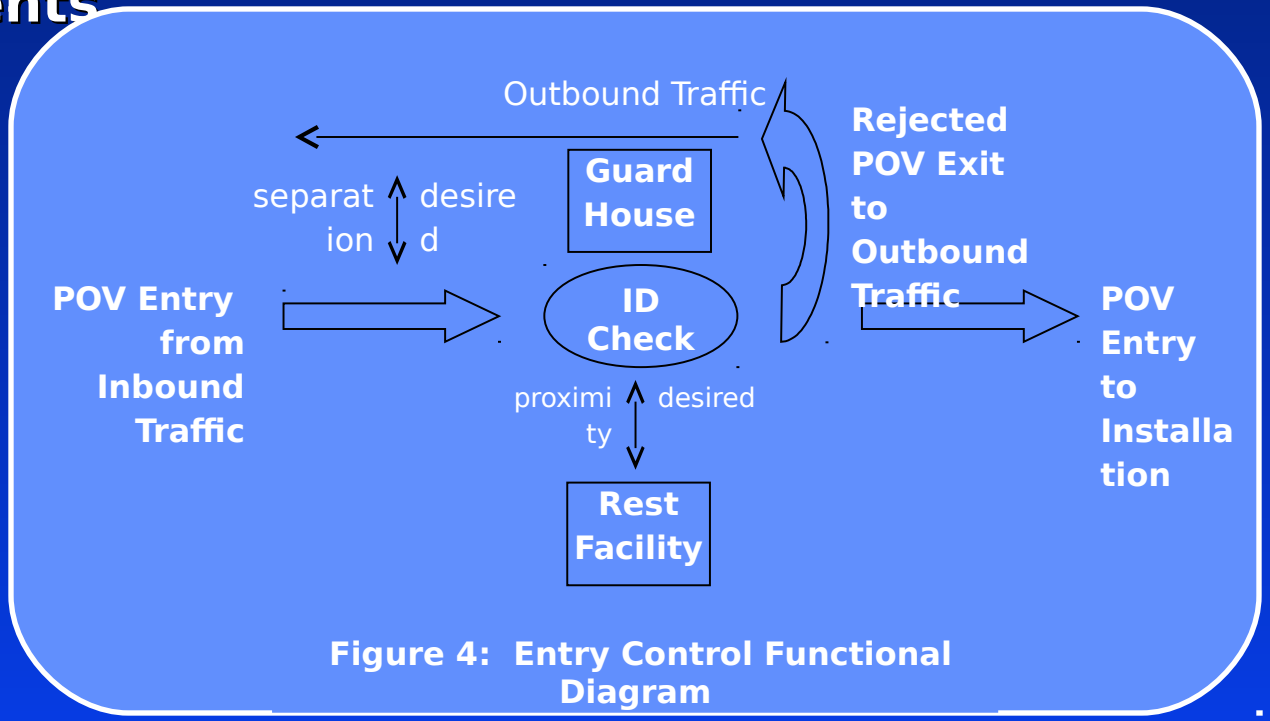
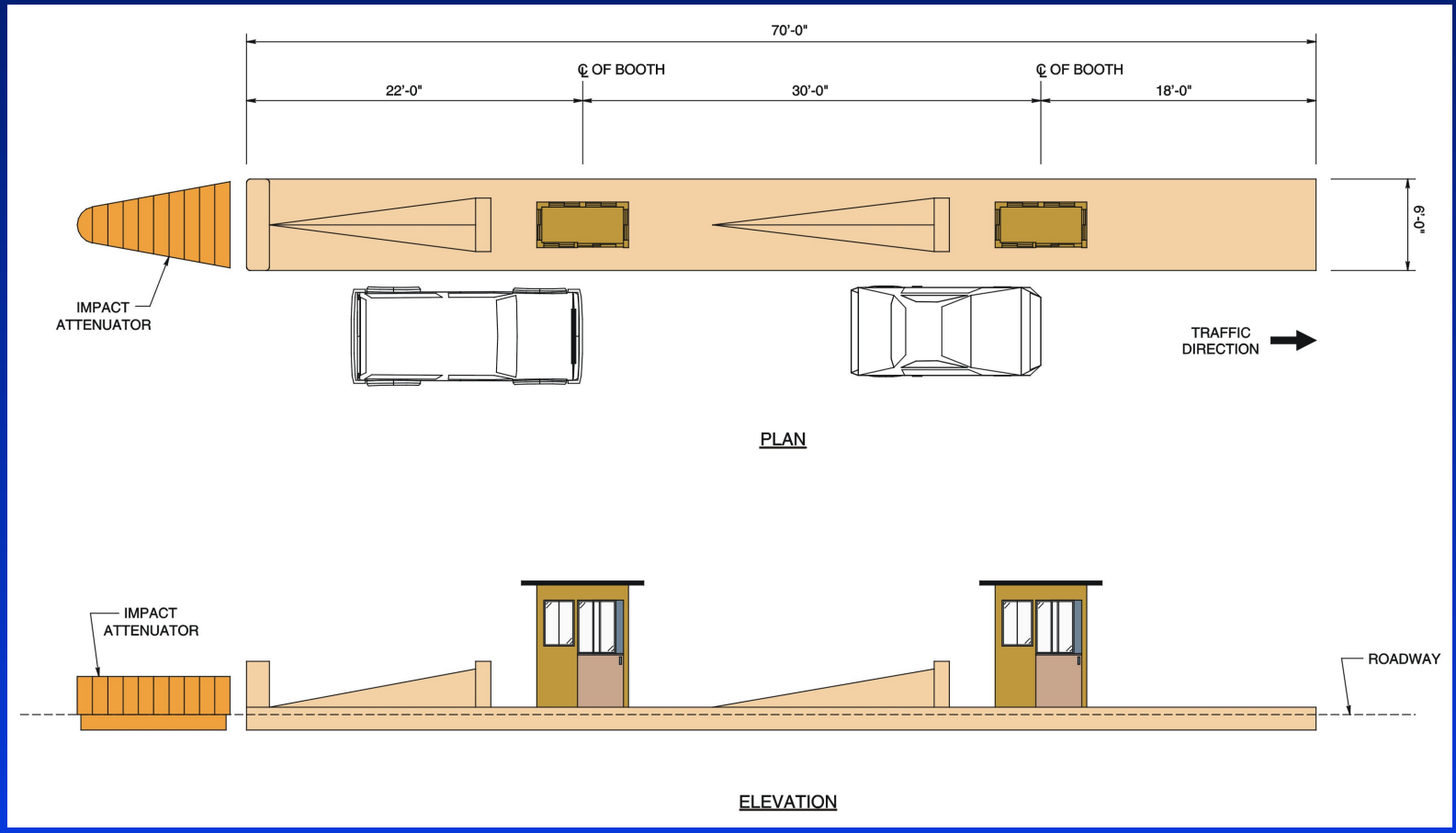


Figure 4: Entry Control Functional Diagram

Design Considerations
ECF Guidelines

- **Security/overwatch provisions**
  - Response time/distance
  - Denial barrier
- **Commercial vehicles**
  - Oversize inspections
  - Shelter for inspection
  - Shelter for drivers

Design Considerations
ECF - Tandem Processing Island



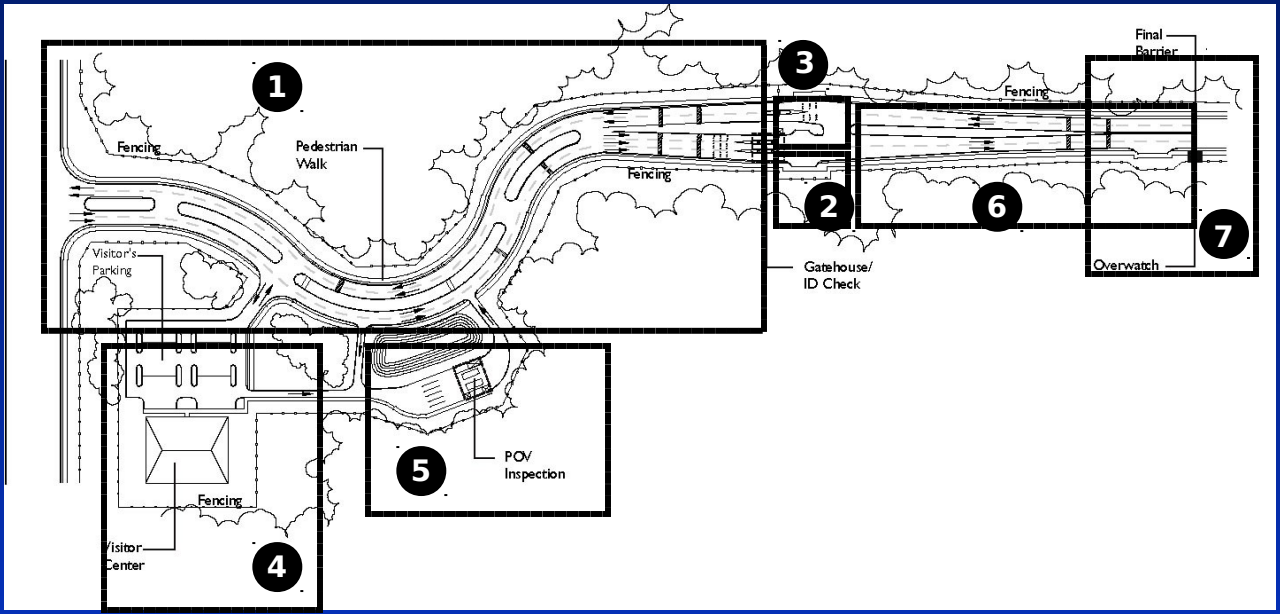
Design Considerations
Gate Volumes and Lane Capacity

- Based on research and analysis of other installation processing rates, inbound lane processing rates or design capacity are:
  - 1 ID checker/lane/hr
    - 100% decal-only check – 400 to 600 vehicles
    - 100% ID and decal check – 300 to 400 vehicles
  - 2 ID checkers/lane/hr
    - 100% ID and decal check – 450 to 600 vehicles
  - 3 ID checkers/lane/hr
    - 100% ID and decal check – 525 to 700 vehicles
  - 4 or more ID checkers/lane/hr
    - No significant increase; possible decrease
- What does this mean?
  - Using 2 ID checkers per lane provides maximum manpower efficiency
  - Using more than 3 ID checkers provides little or no increase in processing rate

Design Considerations
Image - Architecture

- **Define the entry space to convey a sense of arrival or departure through the following methods**
  - Design a three dimensional space (rather than a boundary line) with canopies, changes in pavement color and/or texture, flanked plantings, or changes in lighting intensity, color, or fixture height
  - Install plantings of greater density or ornamental value than surrounding areas
  - Utilize speed reduction and traffic calming techniques
  - Also consider nighttime image and impact
- **Design barricades and fencing for the specific security mode**
  - Limit pedestrian access and views with walls, fencing, and gates
  - Limit vehicular access while permitting pedestrian access and minimal view obstruction with wall segments and/or bollards and plantings

Design Considerations
Components - Main POV Gate



1 – Entry/Traffic Calming
2 – Canopy/ID Check Stations
3 – Guardhouse
4 – Visitor's Center/Parking
5 – POV Vehicle Inspection Facility/Lanes
6 – Roadwork between Canopy and Final Barrier

7 - Final Barriers and Overwatch Area

Design Considerations
Components - Commercial Gate Components

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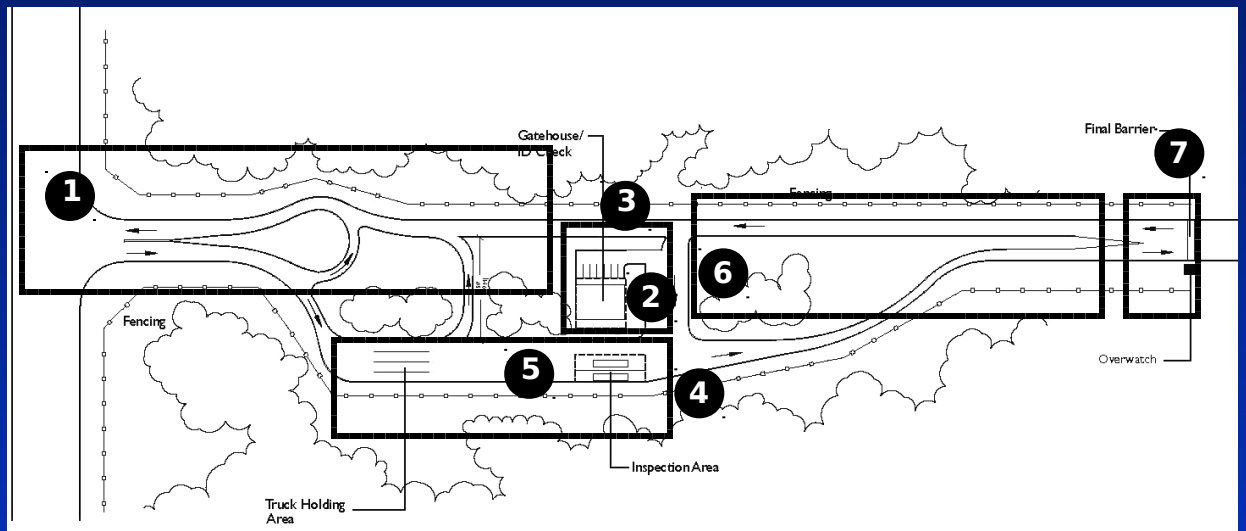


Figure 2C.2 - Commercial Gate Notional Layout

1 – Entry/Traffic Calming
2 – Canopy/ID Check Stations
3 – Guardhouse
4 – Visitor Center/Parking
5 – Truck Vehicle Inspection Facility/Lanes
6 – Roadwork between Canopy and Final B
7 – Final Barrier and Overwatch Area

Design Considerations
Smart Gates

- Can provide information to personnel in guard booth
  - "Smart" card information of approaching vehicle
    - Photo, name, biometric information about who the driver should be
    - Information on vehicle, such as make, model, license plate #
  - Real-time information
    - Photo of actual driver
    - Photo of license plate
    - Weight of vehicle
- Can provide information to the central security control location and/or gatehouse
  - Same information as the guards are receiving
  - Streaming video information
  - Pan, tilt, zoom capabilities

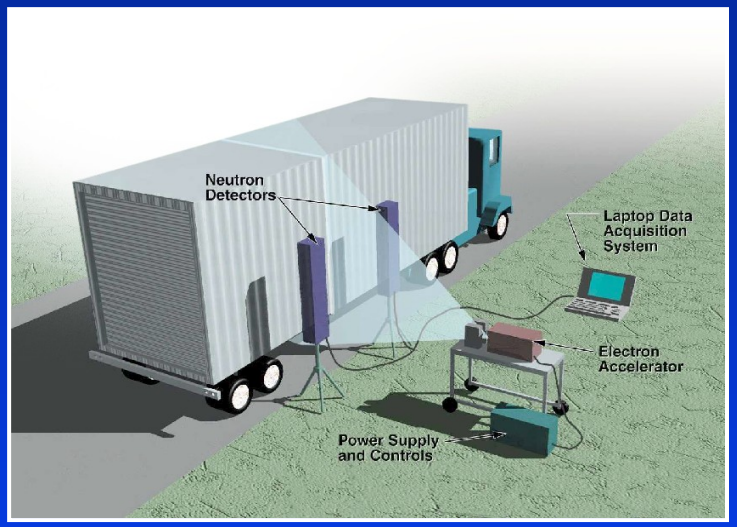
Design Considerations
Smart Gates

- **System Overview**
  - **RFID Reader**
  - **Identification Card Kiosk**
  - **Light Tree**
  - **Arm Bar**
  - **Final Denial Barrier**
  - **Computer Equipment**
    - Digital Camera
    - Access Control
    - Enrollment Station
- **Cameras**
- **Handheld Scanners**
- **Visitor Pass**

Design Considerations
Smart Gates

- **Personal Identification Credential System (PICS)**
  - A long distance (30’) proximity card that’s integrated with active biometric
- **System Includes**
  - PIC Units (one for each user)
  - PICS Reader
  - PICS Enrollment Station

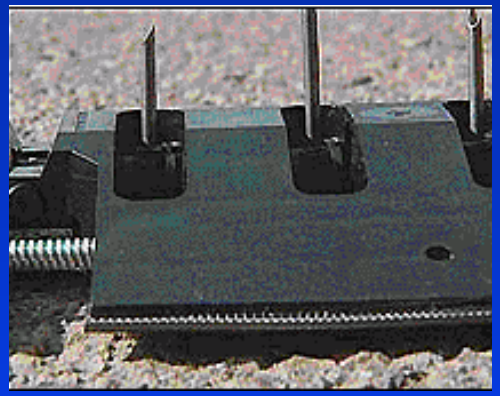
Design Considerations
Smart Gates



- **Remote/Standoff Explosive Detection System (R/SEDS)**
  - Provide detection of specifically identified explosive compounds
  - Two technologies which meet the R/SEDS proof of concept
    - Pulse Photoneutron Activation (PPA)
    - Portable Isotopic Neutron Spectroscopy (PINS)
      - Photoneutrons interact with explosive element's neutrons and produce gamma rays
      - Ramstein AB Install within 12 months

Design Considerations
Smart Gates - Vehicle Arrest Systems

- **Used to prevent unauthorized access to installations**
- **Types:**
  - Vehicle arresting nets
  - Electronic systems
  - Pop-up bollards
  - Hydraulic barricade systems
  - Tire spikes and claws
- **Liability concerns**
- **Multiple lines of defense**
  - Passive to active
  - Dependent of space



Design Considerations
Smart Gates - Intelligent Transportation Systems (ITS)

- Permanent Variable Message Signs (VMS)
  - Overhead sign requires structure, cabinet, and controller.
    - Estimated cost of $100,000 to $200,000 depending on sign capabilities
  - Microwave detection mounted to existing pole or on new pole at 17-foot mounting height can detect speed, duration vehicle occupies detection area, and vehicle classification.
    - Alarm for large high speed vehicles
    - Estimated cost $3,000 to $5,000 for detection.
  - Software integration between sign and detector allows for sign to display preset message, i.e. “10 MIN DELAYS – AT SHILOH GATE”

Design Considerations
Smart Gates

- Andrews AFB
  - Full Smart Gate System
    - Main Gate
    - Virginia Gate
  - PICS
    - Police Gate 20 on the flight line
- Hanscom AFB
  - Smart Gate Lite
  - Upgrade to full system as funding becomes available
- Barnes ANGB, MA
  - Smart Gate Lite
  - Upgrade to full system as funding becomes available
- Ft Belvoir, VA
  - Operational test for Army
  - Willing to fund

Design Considerations
Lighting

- Lighting guidelines
  - Overall 5 to 10 foot-candles at ECP
  - Color rendition index greater than 50
  - High pressure sodium lighting preferred
  - Transitional lighting with multiple fixtures
  - Focused, low-level lighting needed for ID processing; higher levels needed for vehicle inspection areas

Design Considerations
Site Specific Items

- Heating and/or cooling
- Snow melting
- Snow removal
- Wind and windbreaks
- Off base traffic situations
- Safety
- Local SF TTPs (Techniques, Tactics and Procedures)
  - Handling of unauthorized vehicles?
  - Facility configuration (chicken or egg?)
- Melding of existing and new
- Phasing

Design Considerations
Funding

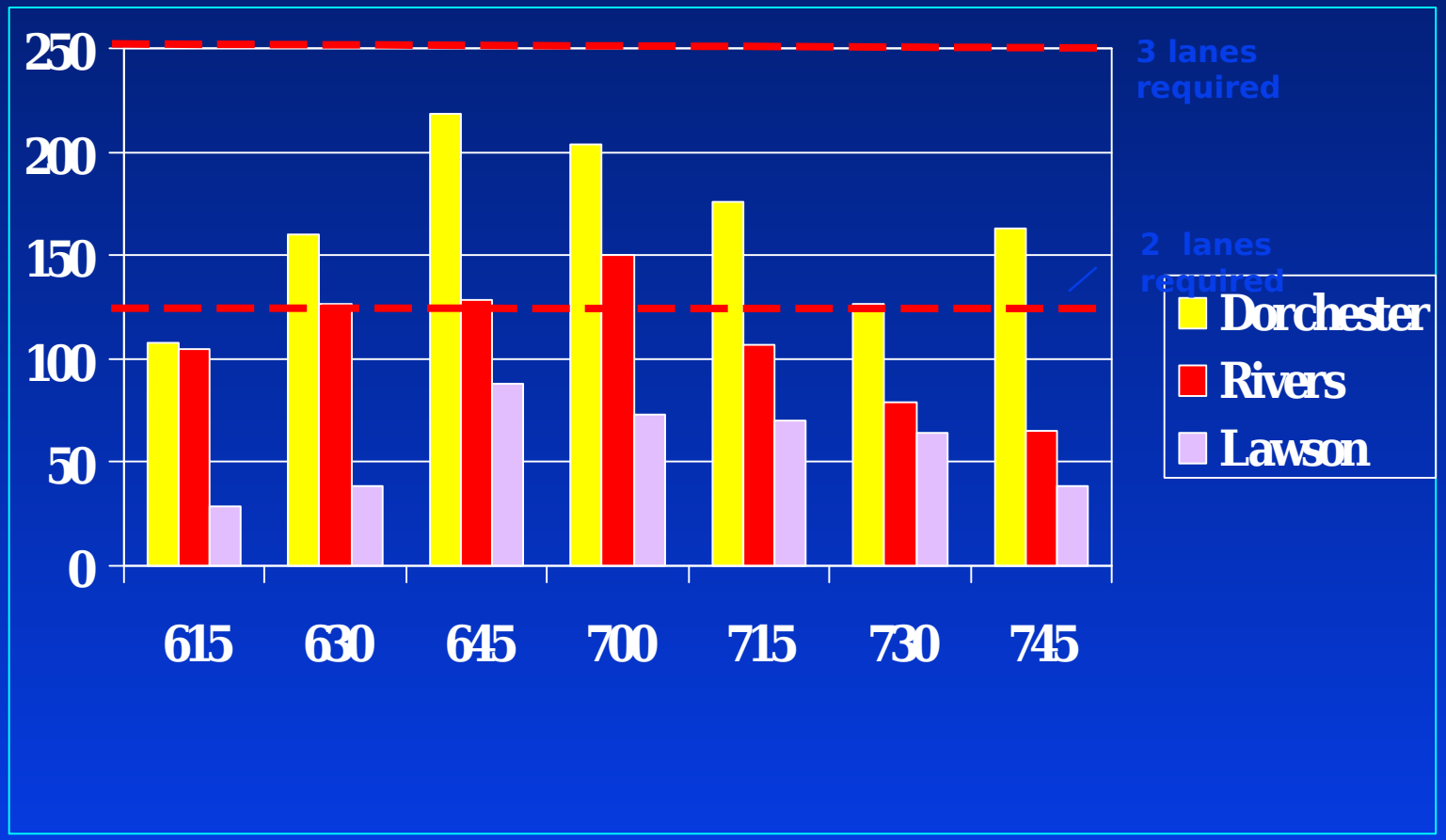
- MILCON limitations
- AFI 32-1032, planning and programming Appropriated Funded Maintenance, Repair and Construction Projects,
  - Section 3.4.3.1 – “Each concurrent project in a facility must result ina complete and useable improvement without being dependent on another project”
  - Section 4.1.2.1 – “Existing components of a facility may be repaired by replacement and replacement may be up to current….standards or codes.”
  - Section 4.1.2.1.6 – “To the extent that the force protection measures are installed for the protection of a particular facility, they may still be considered repair of that facility”
- Structure components of Entry Control Facilities to be independent

Example
Charleston AFB Dorchester Gate

Example
Dorchester Gate: Existing Conditions

Category	Details (Observed during Alpha condition)
Usage	▪ Decals (DD Form 2220), passes (DD Form 75), and new visitors
Hours	▪ 24-hour operation
No. of Lanes	▪ 2 inbound / 2 outbound lanes at gatehouse
Traffic Data	▪ Morning peak hour inbound volume of 760 ▪ Morning delays of 0-3 minutes ▪ Maximum queue length of 30 vehicles
Manpower	▪ 1 ID checker per lane (outer inbound lane only used when a backup exists on inner lane) ▪ 3-5 SF personnel operate gate, including visitor pass office
Notes	▪ Motorists turning off Dorchester Rd avoid using outer lane to gate due to its sporadic use by the ID checker ▪ An average of 50–60 visitors are processed each weekday ▪ Visitor parking area is marginally inadequate ▪ POV inspection area is totally inadequate ▪ Gatehouse has good design and size ▪ Lighting is adequate

Example
Gates Volumes and Lane Capacity
Inbound 15-minute morning peak period traffic coun



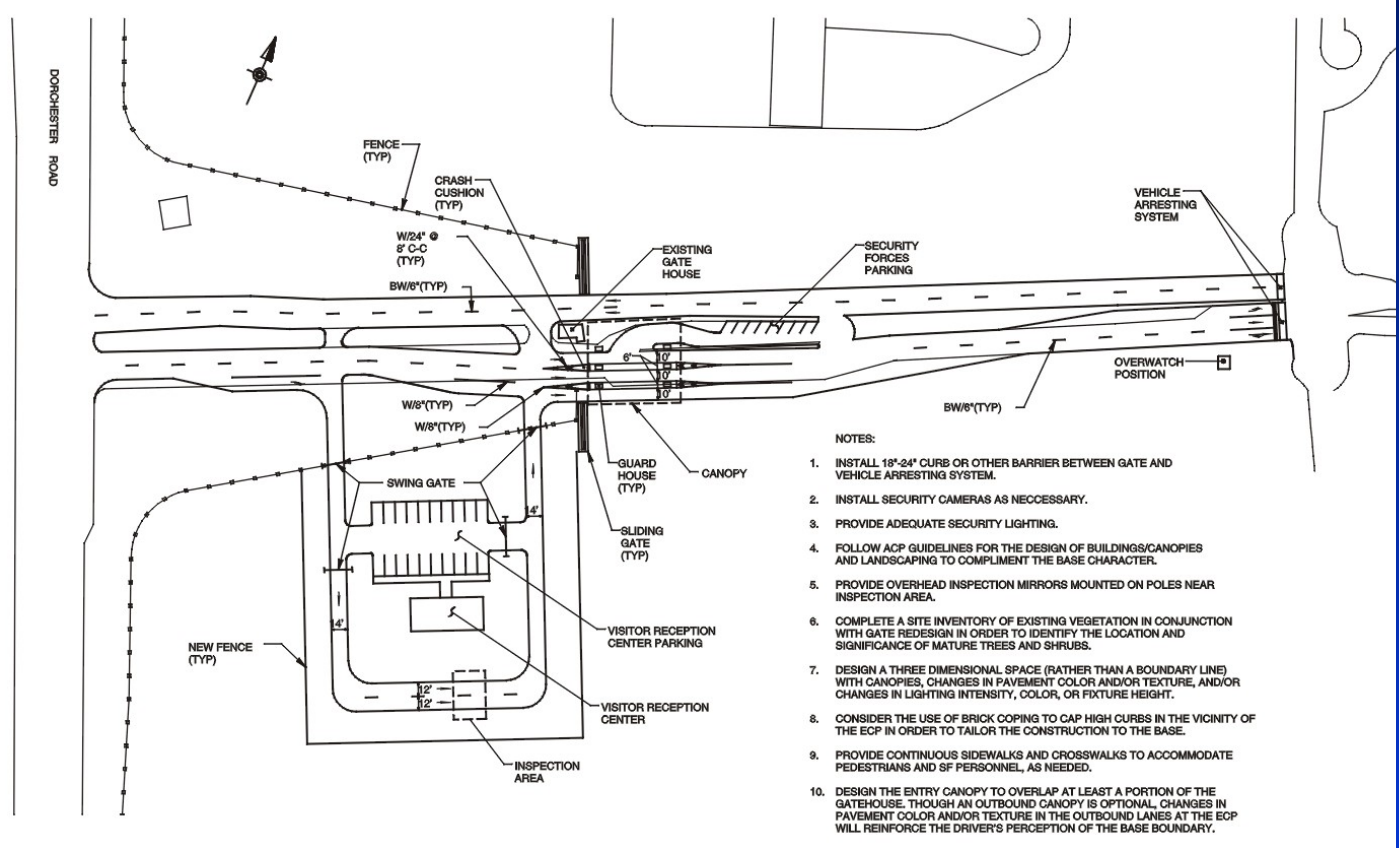
Example
Recommended Lanes and Gate Usage

Gate	Recommended Lanes
Dorchester	▪ 3 inbound lanes with tandem (2) ID checker positions (second and third lanes used only during peaks) ▪ Visitor Center with parking and POV inspection area with 1-bay shelter
Rivers	▪ 2 inbound lanes with tandem ID checker positions ▪ Use 1 ID checker in each lane for greatest efficiency; use tandem ID check as needed ▪ POV inspection lane with 1-bay canopy ▪ Truck inspection area with 1-bay canopy and 2 stacking lanes
Lawson	▪ 2 inbound and 2 outbound lane (no change)

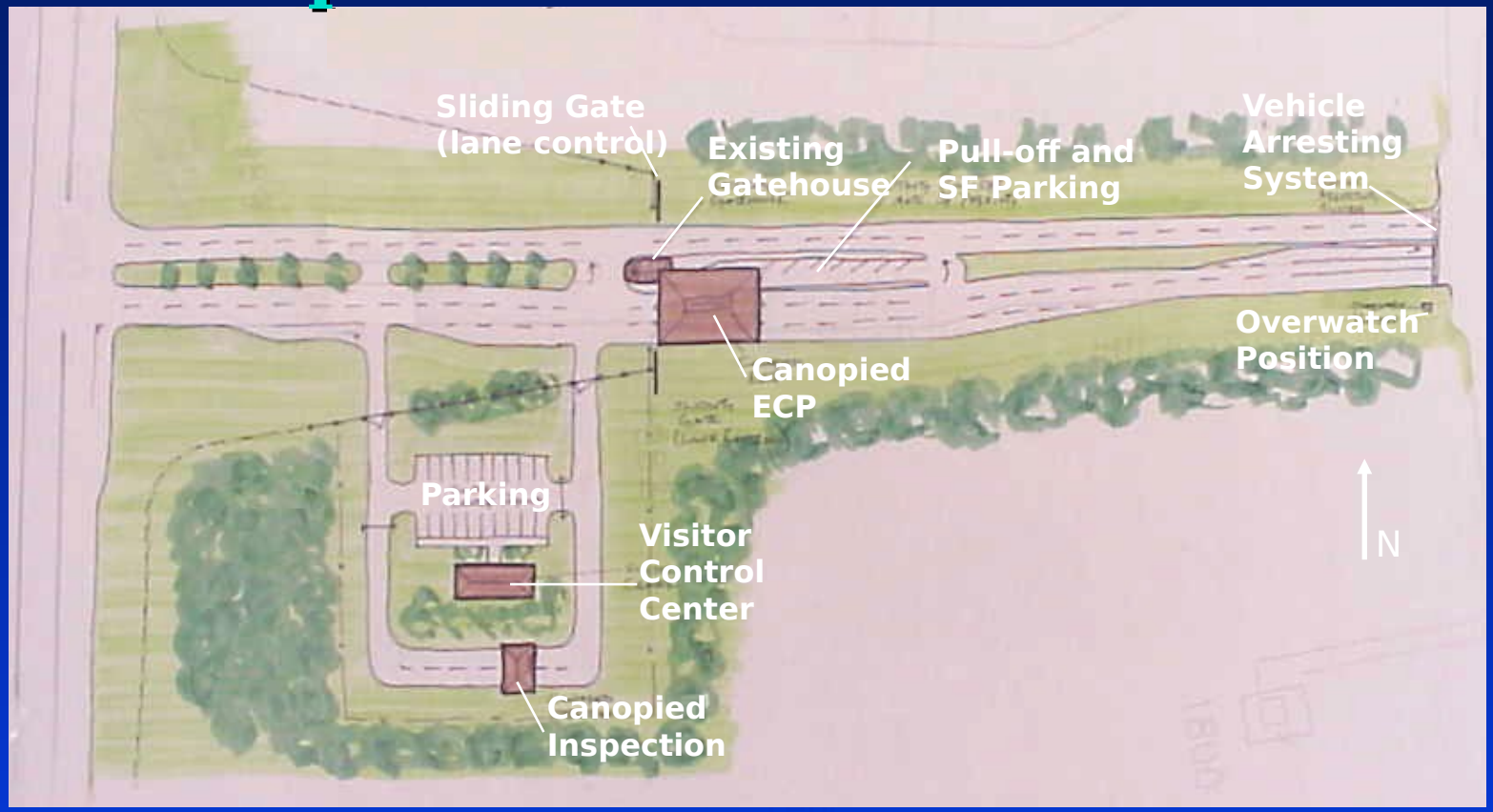
Example
Dorchester Gate Recommendations

- Request local transportation engineers re-evaluate and adjust traffic signal timings at Dorchester Road and Hill Boulevard such that the southbound provides adequate green time to meter traffic to the ECP and to limit queuing on Dorchester Road.
- Utilize 2 inbound lanes throughout the morning and mid-day peak periods regardless of demand
- Construct a third inbound processing lane
- Construct a canopy over ID check area
- Construct a random inspection area in advance of ECP area
- Construct a visitor control center (VCC) in advance of the ECP area
- Lengthen the left-turn lane on the eastbound Hill Boulevard approach to O'Neal Ave
- Integrate improvements with base proposed Hill Boulevard widening and the minor improvements recommended in *Traffic Engineering Guidance* prepared by MTMCTEA in December 2001

Example
Dorchester Gate – Design Concept


DORCHESTER ROAD
FENCE (TYP)
CRASH CUSHION (TYP)
W/24" @ 8' C-C (TYP)
BW/6"(TYP)
EXISTING GATE HOUSE
SECURITY FORCES PARKING
VEHICLE ARRESTING SYSTEM
OVERWATCH POSITION
BW/6"(TYP)
W/8"(TYP)
W/8"(TYP)
GUARD HOUSE (TYP)
CANOPY
SWING GATE
SLIDING GATE (TYP)
VISITOR RECEPTION CENTER PARKING
NEW FENCE (TYP)
VISITOR RECEPTION CENTER
INSPECTION AREA
NOTES:
1. INSTALL 18"-24" CURB OR OTHER BARRIER BETWEEN GATE AND VEHICLE ARRESTING SYSTEM.
2. INSTALL SECURITY CAMERAS AS NECCESSARY.
3. PROVIDE ADEQUATE SECURITY LIGHTING.
4. FOLLOW ACP GUIDELINES FOR THE DESIGN OF BUILDINGS/CANOPIES AND LANDSCAPING TO COMPLIMENT THE BASE CHARACTER.
5. PROVIDE OVERHEAD INSPECTION MIRRORS MOUNTED ON POLES NEAR INSPECTION AREA.
6. COMPLETE A SITE INVENTORY OF EXISTING VEGETATION IN CONJUNCTION WITH GATE REDESIGN IN ORDER TO IDENTIFY THE LOCATION AND SIGNIFICANCE OF MATURE TREES AND SHRUBS.
7. DESIGN A THREE DIMENSIONAL SPACE (RATHER THAN A BOUNDARY LINE) WITH CANOPIES, CHANGES IN PAVEMENT COLOR AND/OR TEXTURE, AND/OR CHANGES IN LIGHTING INTENSITY, COLOR, OR FIXTURE HEIGHT.
8. CONSIDER THE USE OF BRICK COPING TO CAP HIGH CURBS IN THE VICINITY OF THE ECP IN ORDER TO TAILOR THE CONSTRUCTION TO THE BASE.
9. PROVIDE CONTINUOUS SIDEWALKS AND CROSSWALKS TO ACCOMMODATE PEDESTRIANS AND SF PERSONNEL, AS NEEDED.
10. DESIGN THE ENTRY CANOPY TO OVERLAP AT LEAST A PORTION OF THE GATEHOUSE. THOUGH AN OUTBOUND CANOPY IS OPTIONAL, CHANGES IN PAVEMENT COLOR AND/OR TEXTURE IN THE OUTBOUND LANES AT THE ECP WILL REINFORCE THE DRIVER'S PERCEPTION OF THE BASE BOUNDARY.

Example
Dorchester Gate – Development Plan



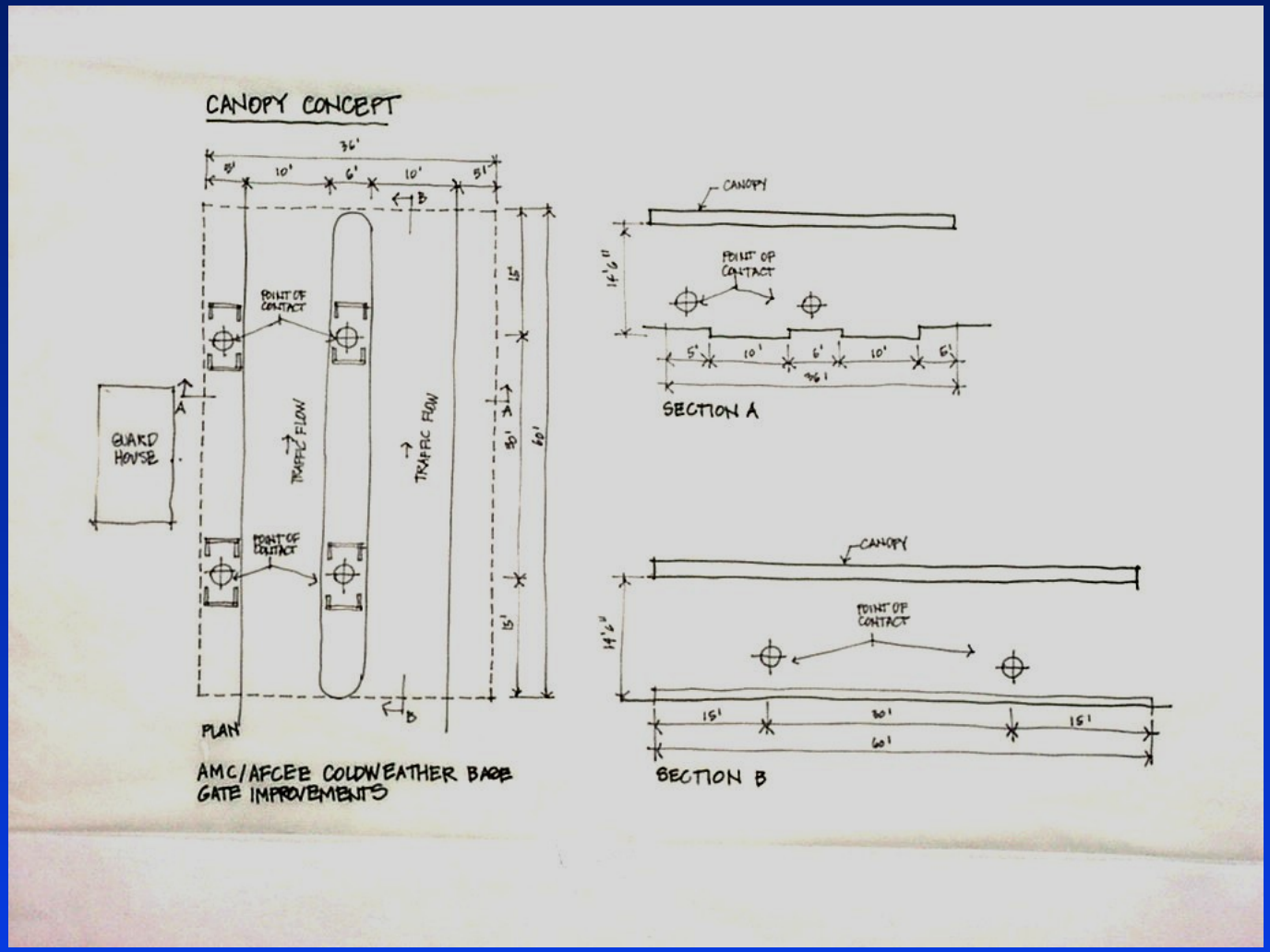
Design
AMC Cold Weather Gates Design Charrette

- Back grounded with AMC site visits, MTMC studies and Installation Architectural guides
- 6 installation architects, AMC/CE, AMC/SF, Concept AE, Design Build contractor
- Week long effort following guidelines from MTMC studies and draft ECF design guidelines
- Goals
  - Protection of guards
  - Entry control
  - Base image
  - Funding under $750k
- What should it be? What could it be?

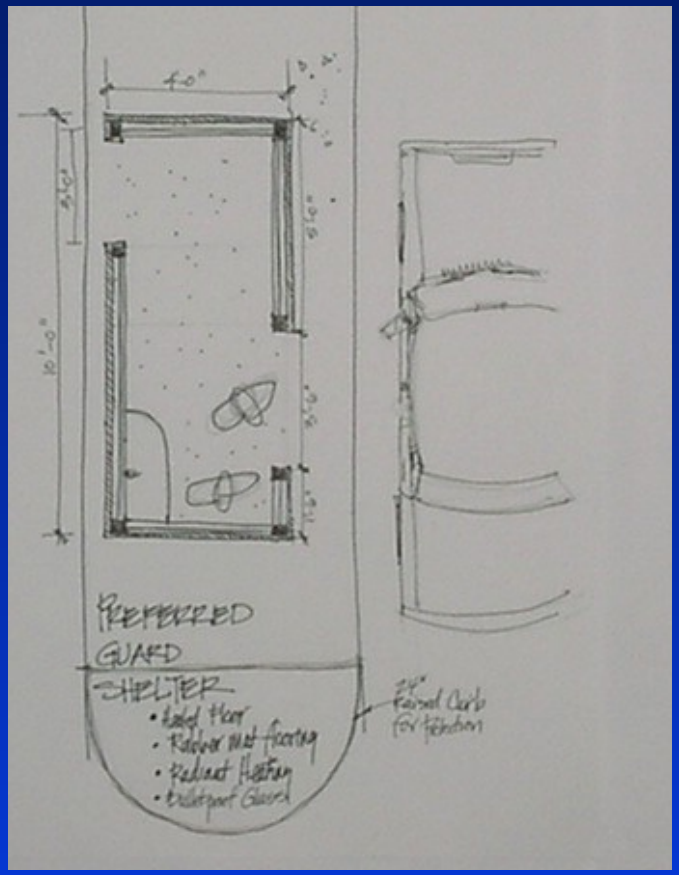
Design
AMC Cold Weather Gates Design Charrette

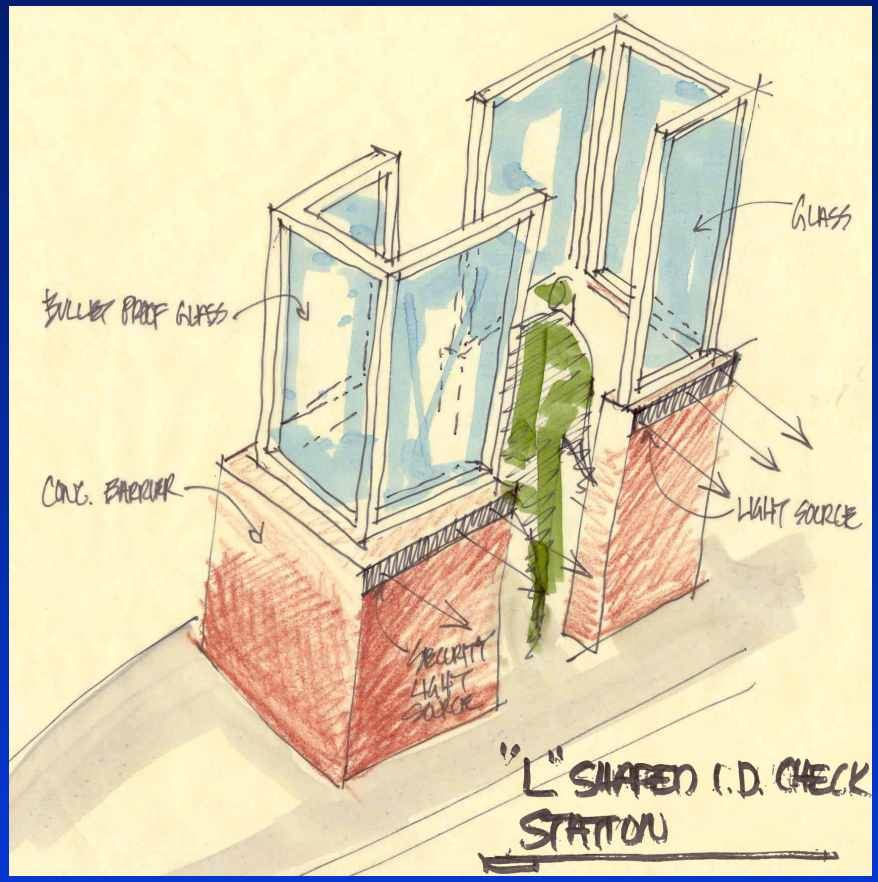
- **Results**
  - Canopy design options for each installation
  - Opposing “L’s” check station
  - Designs consistent with base architecture
  - Airman protection from inclimate weather
  - Lighting requirements
  - Pavement heating options
  - 10m setback vs. 25 meter
  - Programming cost estimates
  - Constructability reviews
  - Initial installation buy-in

Design
Typical Site Layout

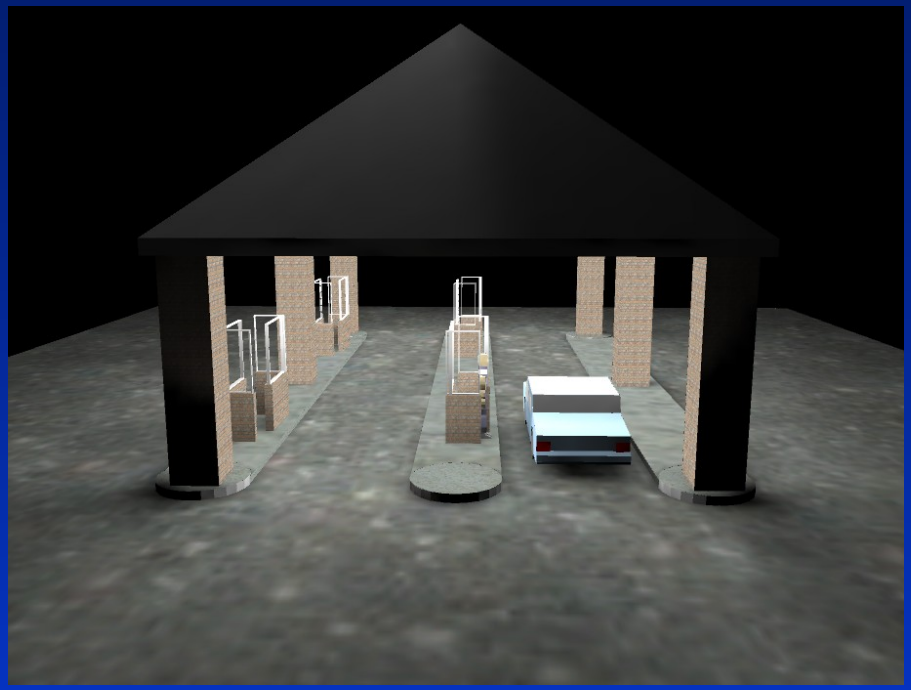


Design
ID Check Station



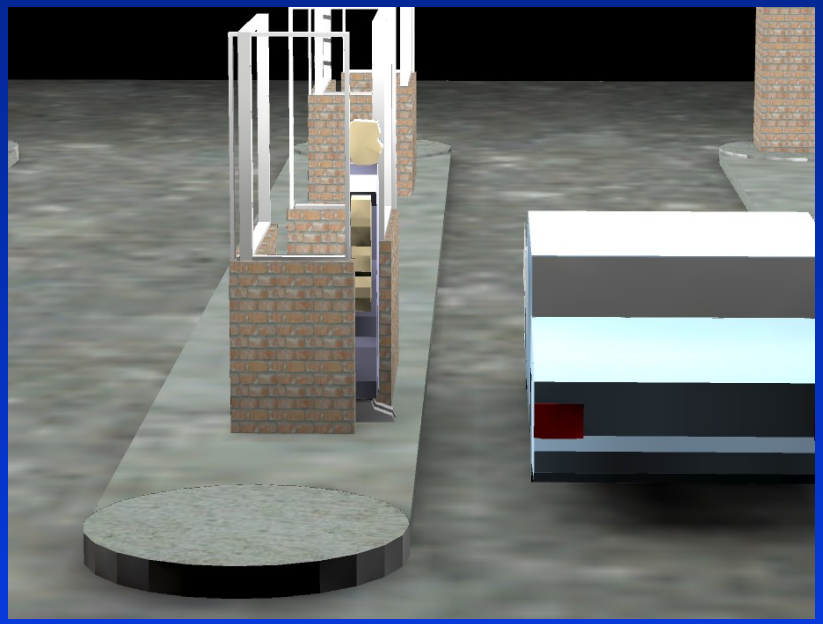


Design
Charrette - Lighting



- Indirect floods
- Photo cell control

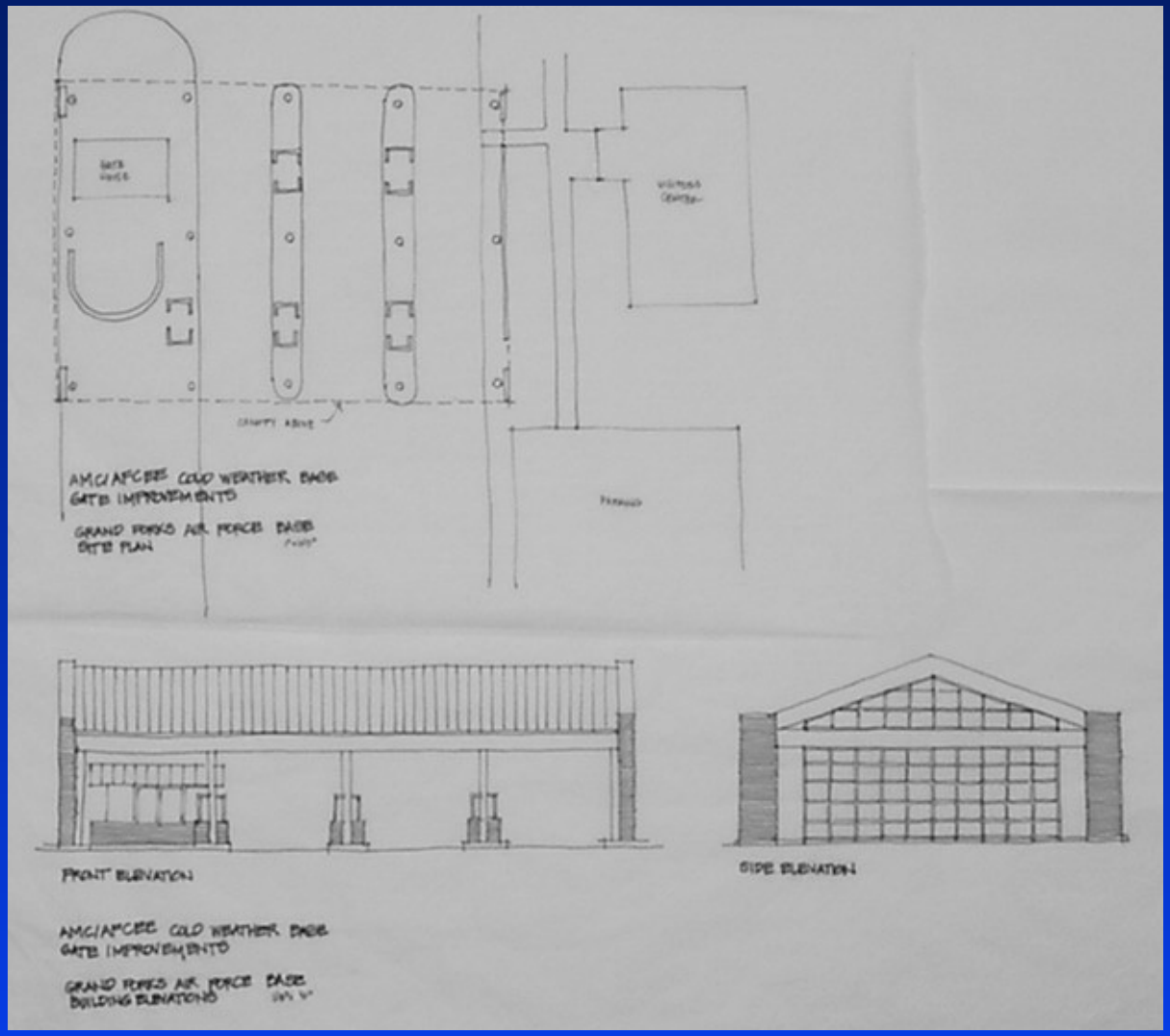
- 30-40 fc maintained
- Locally controlled task lighting



Design
Mechanical/Heating

- Overhead Infrared Heating @ ID Check Stations
  - Extends over SF/vehicular interface
- Slab Heating
  - Hydronic: Glycol closed loop
  - Electric
- Target Heating Range
  - 40 degrees F
  - Reasonably comfortable

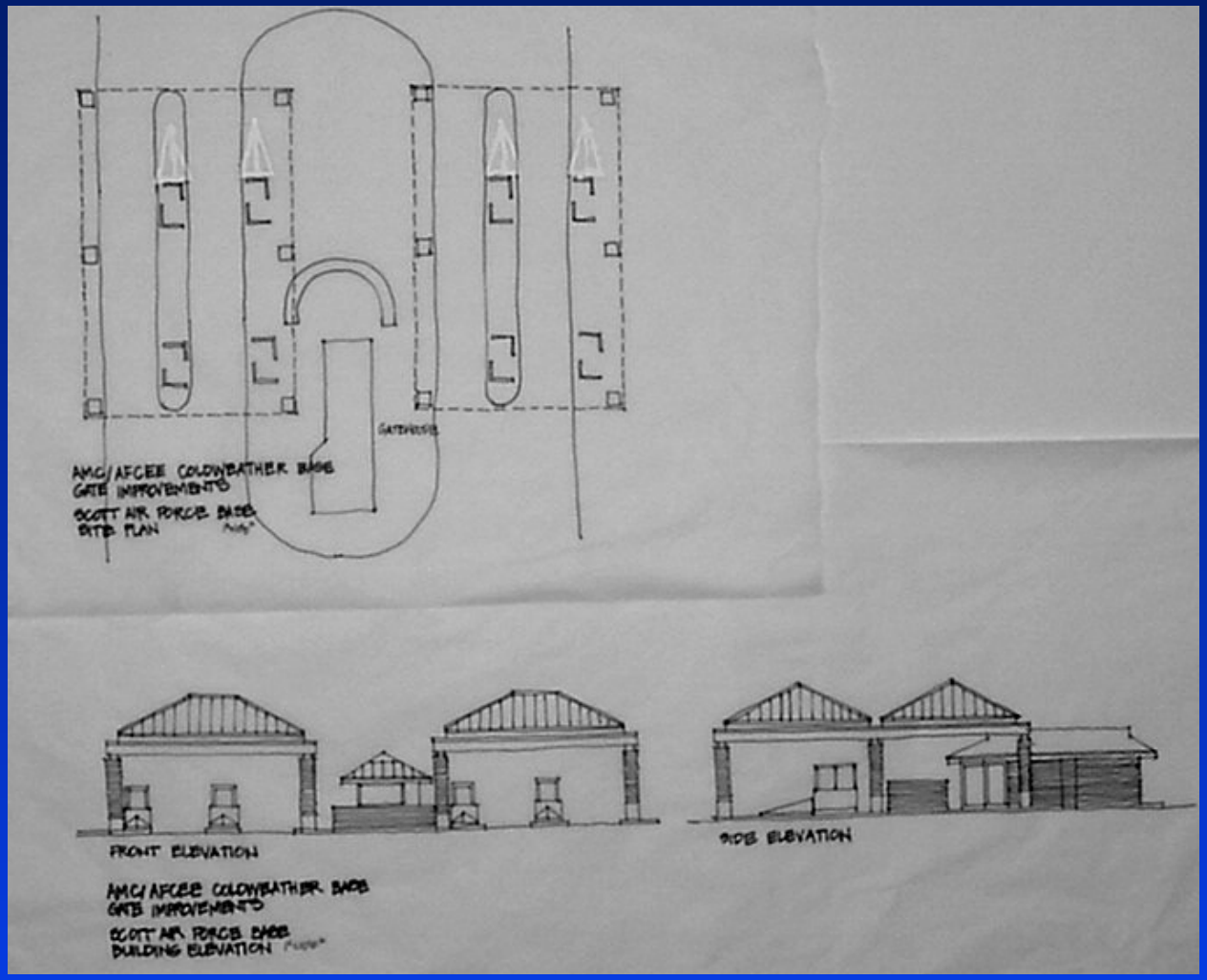
Design
Grand Forks Plans


AMC/AFCEE COLD WEATHER BASE GATE IMPROVEMENTS
GRAND FORKS AIR FORCE BASE SITE PLAN
FRONT ELEVATION
SIDE ELEVATION
AMC/AFCEE COLD WEATHER BASE GATE IMPROVEMENTS
GRAND FORKS AIR FORCE BASE BUILDING ELEVATIONS

Design
Grand Forks Images

Design
Grand Forks AFB Entry Canopy Concepts

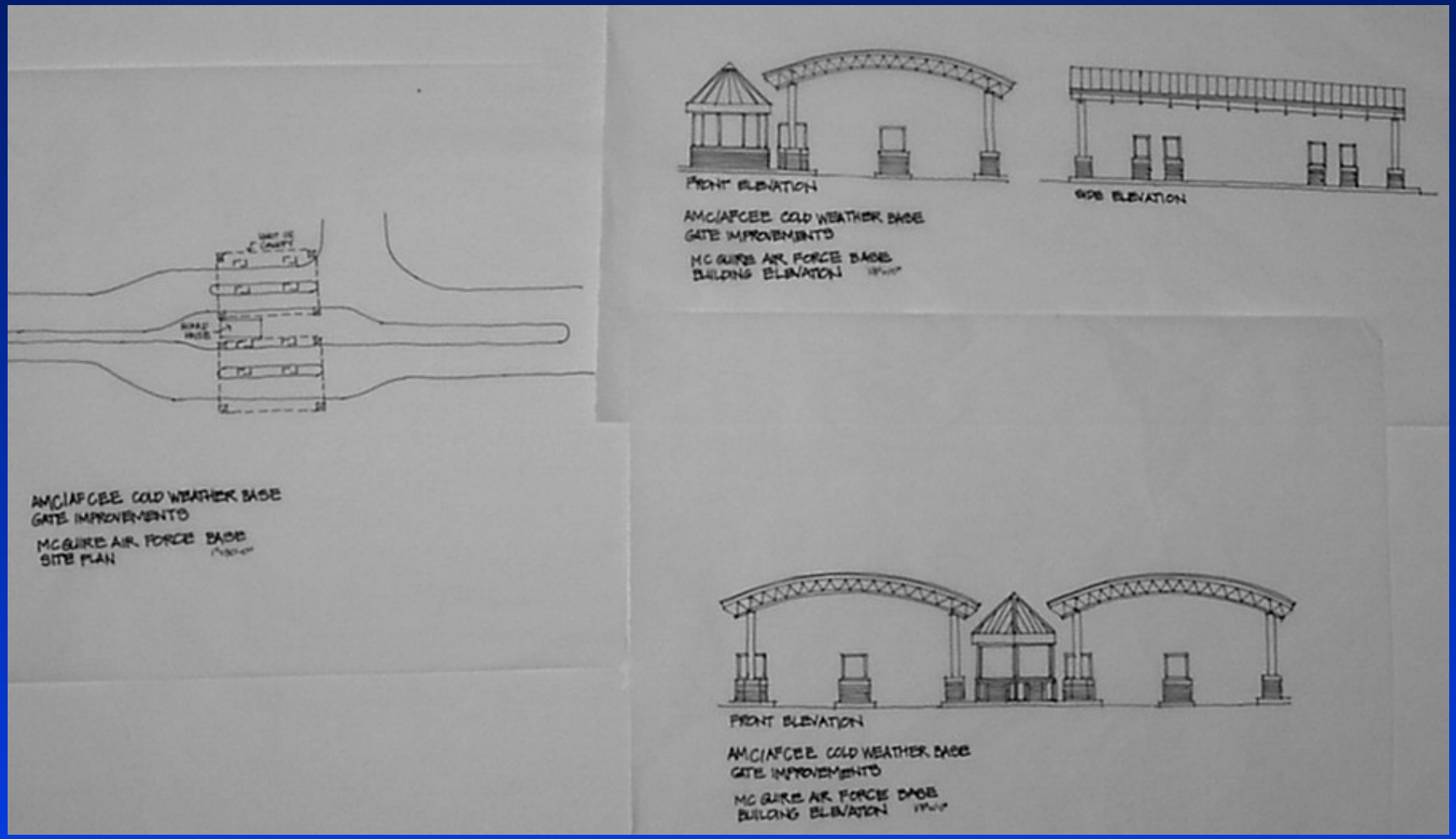
Design
Scott Plans



Design
Scott Images

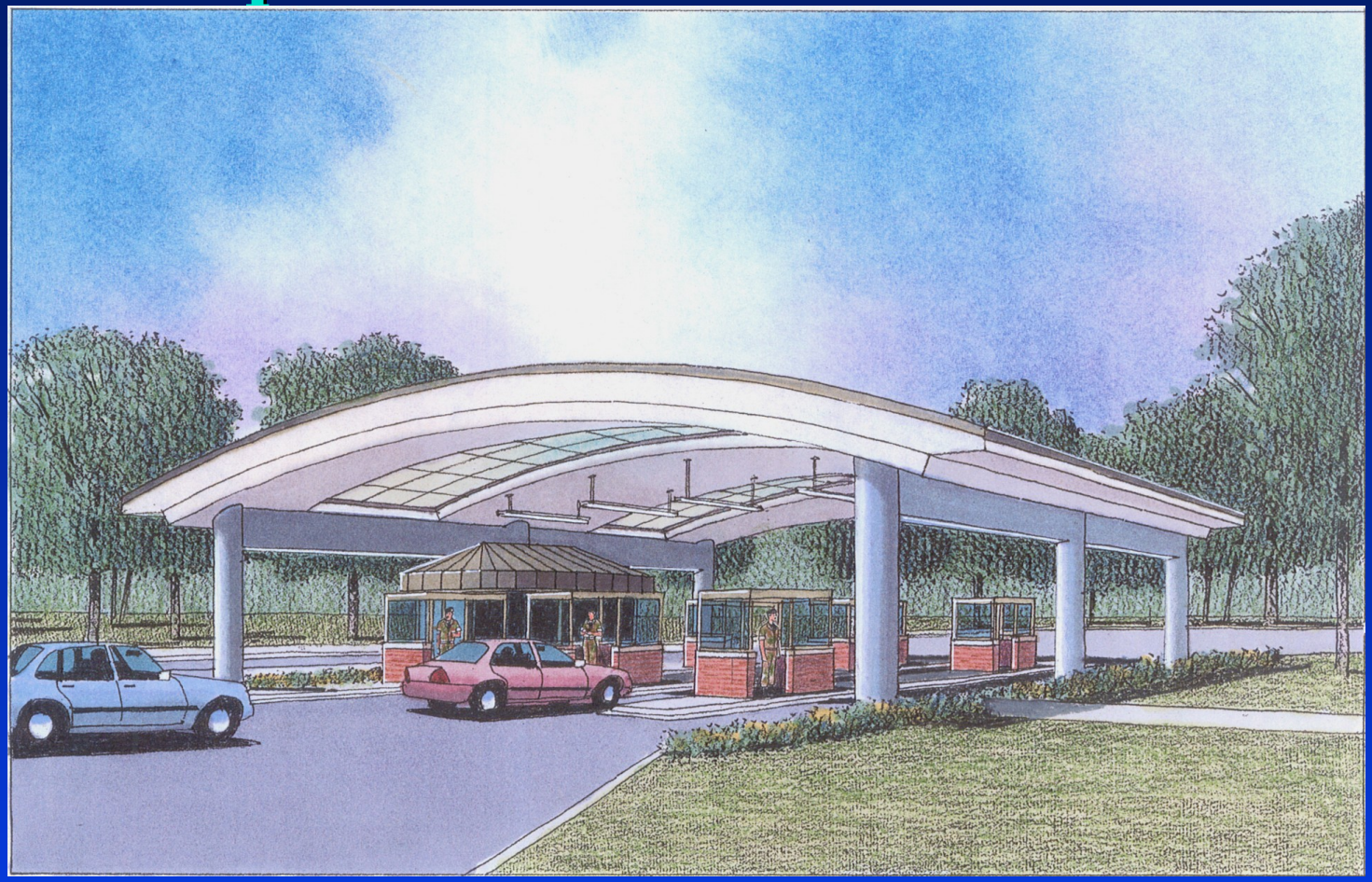
Design
Scott AFB Entry Canopy Concepts

Design
McGuire Plans

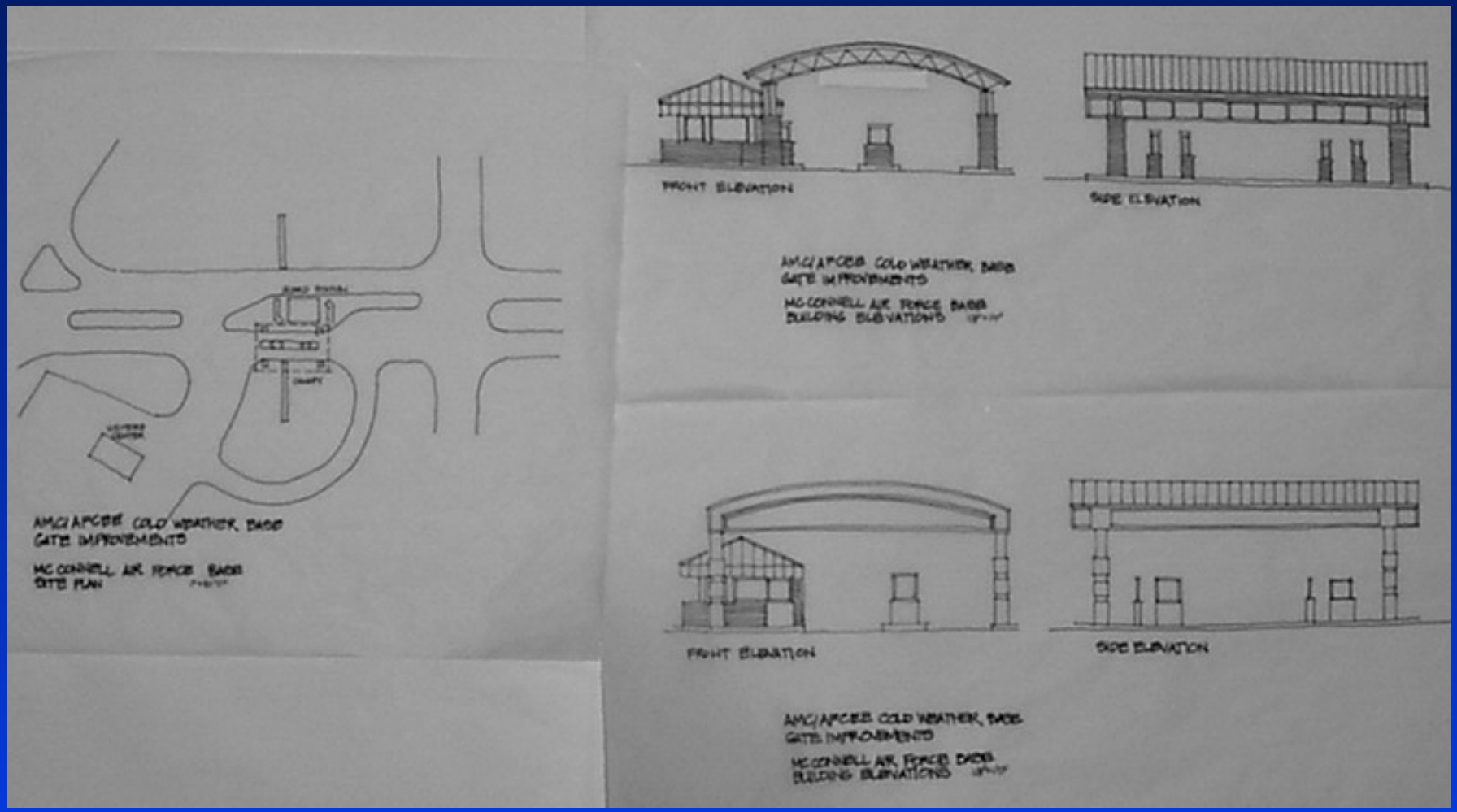


Design
McGuire Images

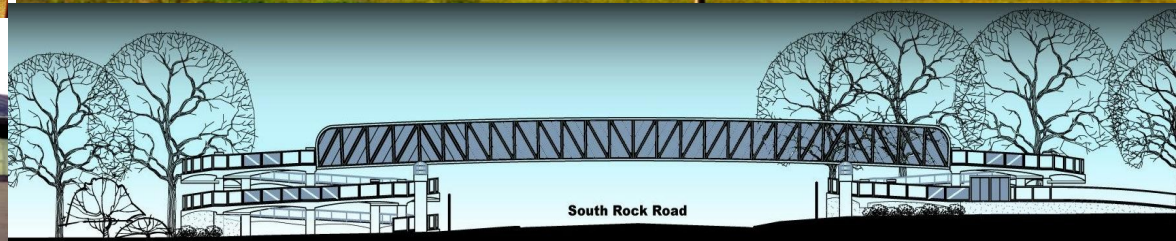
Design
McGuire AFB Entry Canopy Concepts



Design
McConnell Plans



Design
McConnell Images

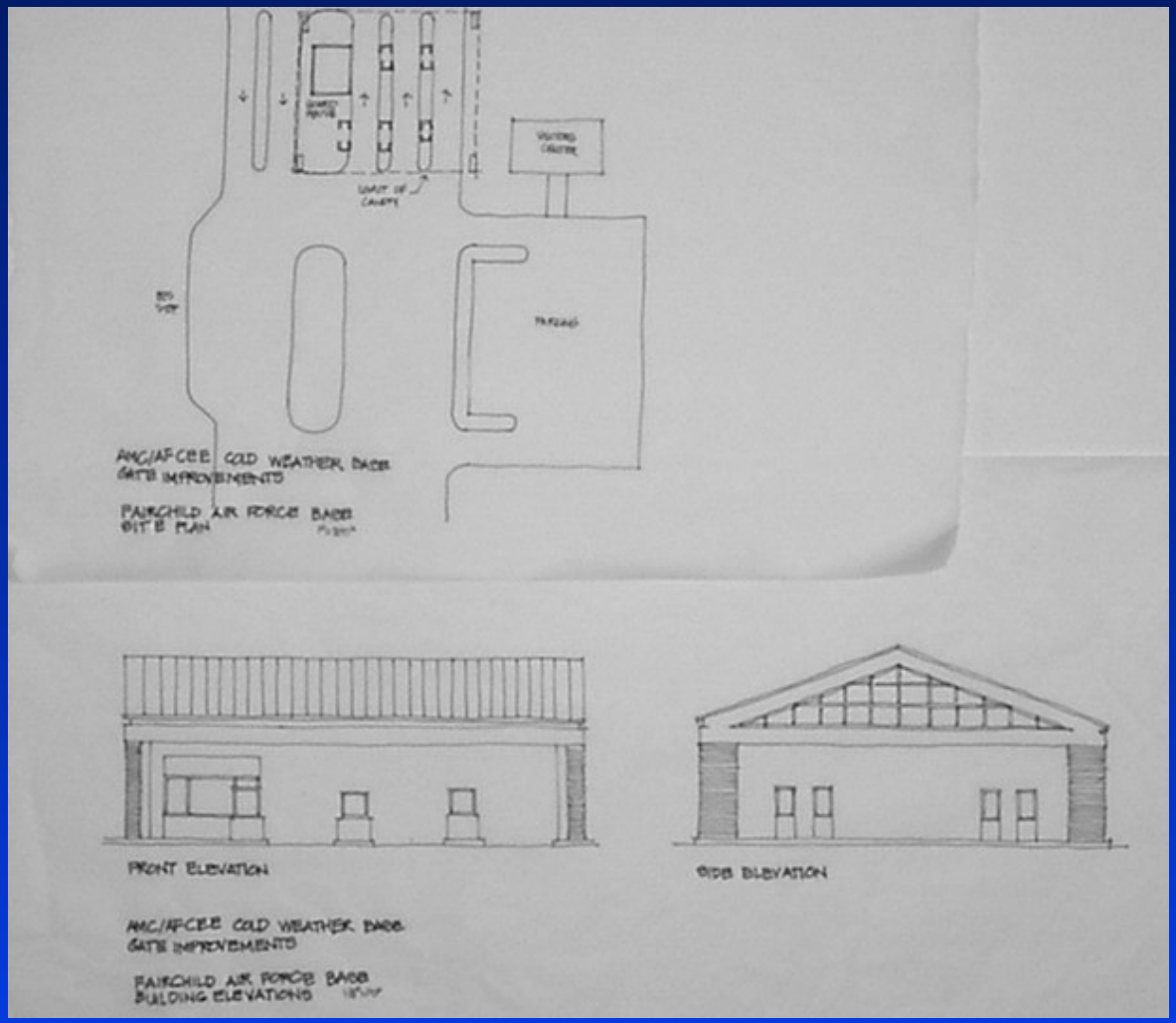


McConnell Air Force Base
Family Housing Area Safety Improvements

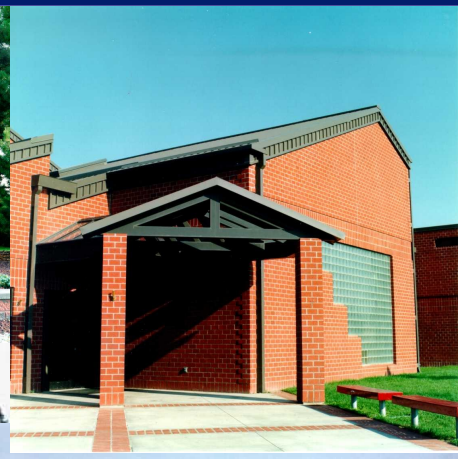
SOUTH ELEVATION
Not To Scale

Design
McConnell AFB Entry Canopy Concepts

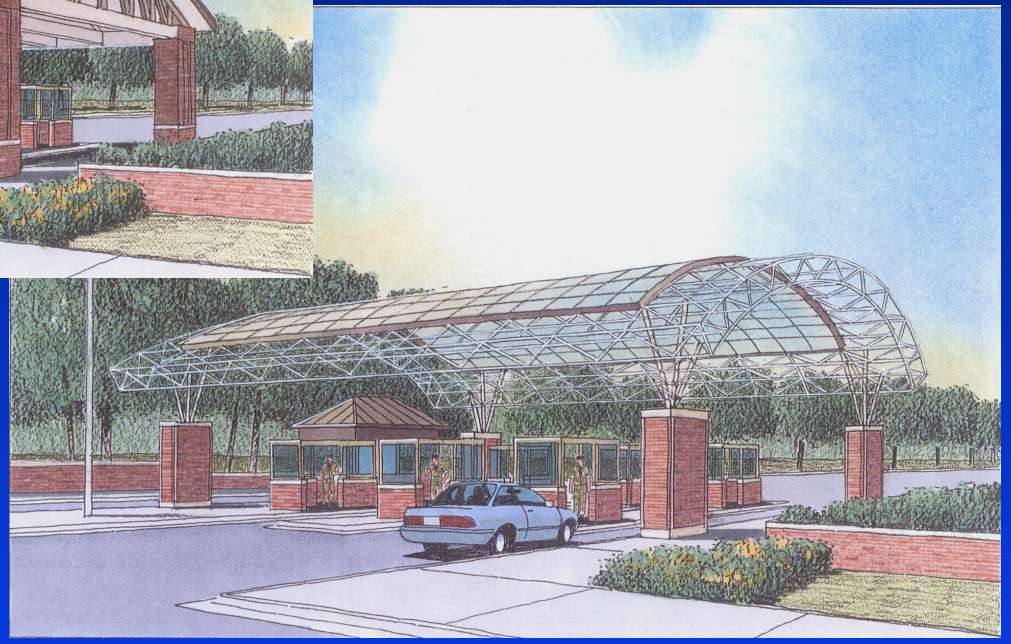
Design
Fairchild Plans



Design
Fairchild Images



Design
Fairchild AFB Entry Canopy Concepts



Design
Detail - Speed Control at ECFs

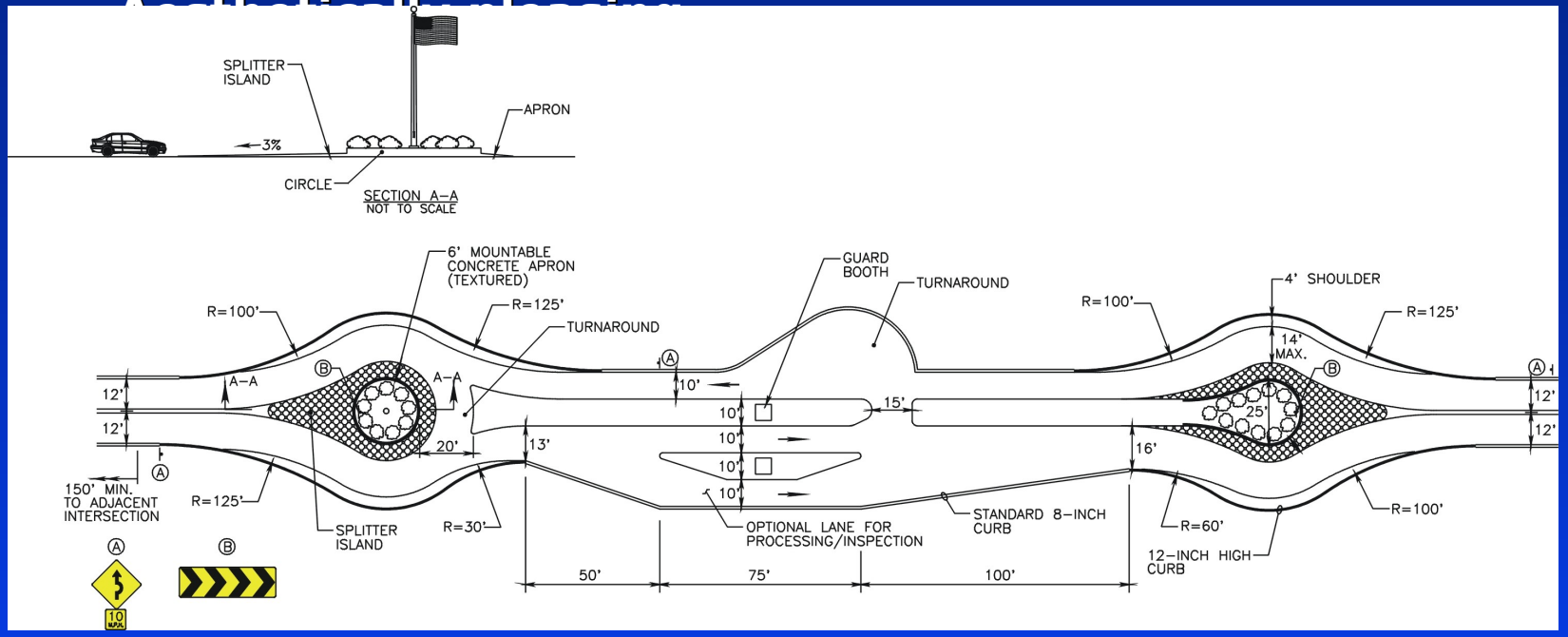
- **Alternatives**
  - Speed reduction signing
  - Rumble strips
  - Speed humps (not bumps)
  - Stamped, colored pavement
  - Horizontal alignment changes
  - Force protection chicanes
  - Reduced lane widths (10-ft versus 12-ft)
  - Flashing warning devices
  - Radar message boards
- **Jersey Barriers are often used on installations to slow inbound and outbound traffic by forcing vehicles into a serpentine flow. They are effective, but have several drawbacks:**
  - Difficult to move, possibly delaying passage of oversize vehicles
  - Not aesthetically compatible with a nice landscaped entrance
  - Barrier blunt ends pose a hazard to motorists
  - Often are not reflectorized
  - Often improperly and inconsistently spaced

Design
Detail - Speed Control at ECFs

- Speed Humps
  - They slow vehicles without the abrupt grade change typical of speed bumps.
  - Preferred versus speed bumps which are discouraged.
  - Longer and wider than speed bumps.
  - Typical dimensions are 3-4 inches high and 12 ft wide with a parabolic shape.
  - Design speed of 15 to 20 mp

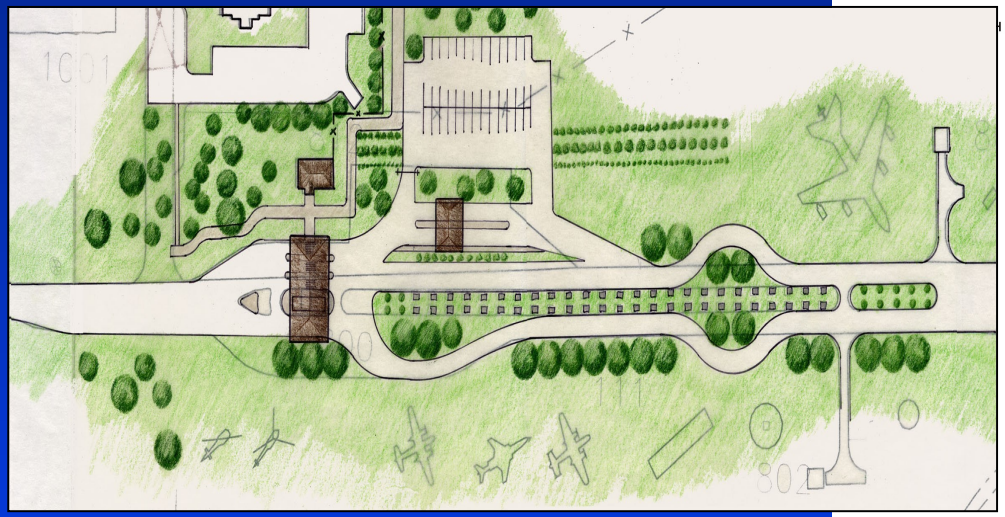
Design
Detail - Speed Control at ECFs

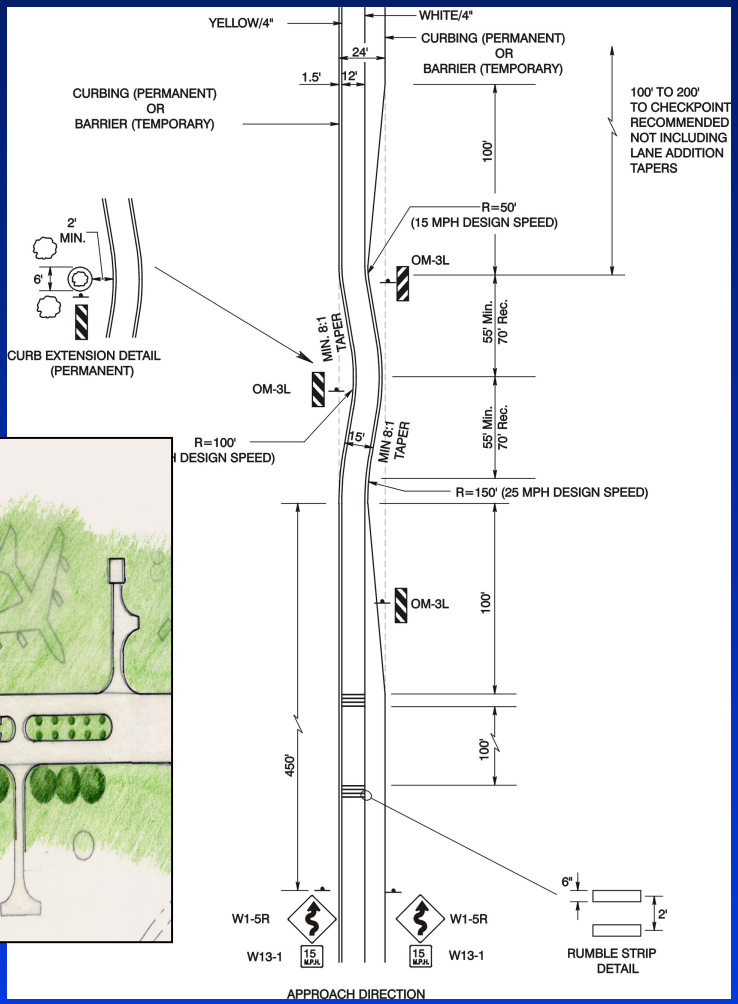
- Dog Bone Concept
  - **Horizontal alignment change encourages speed reduction**
  - **Safer than barriers**



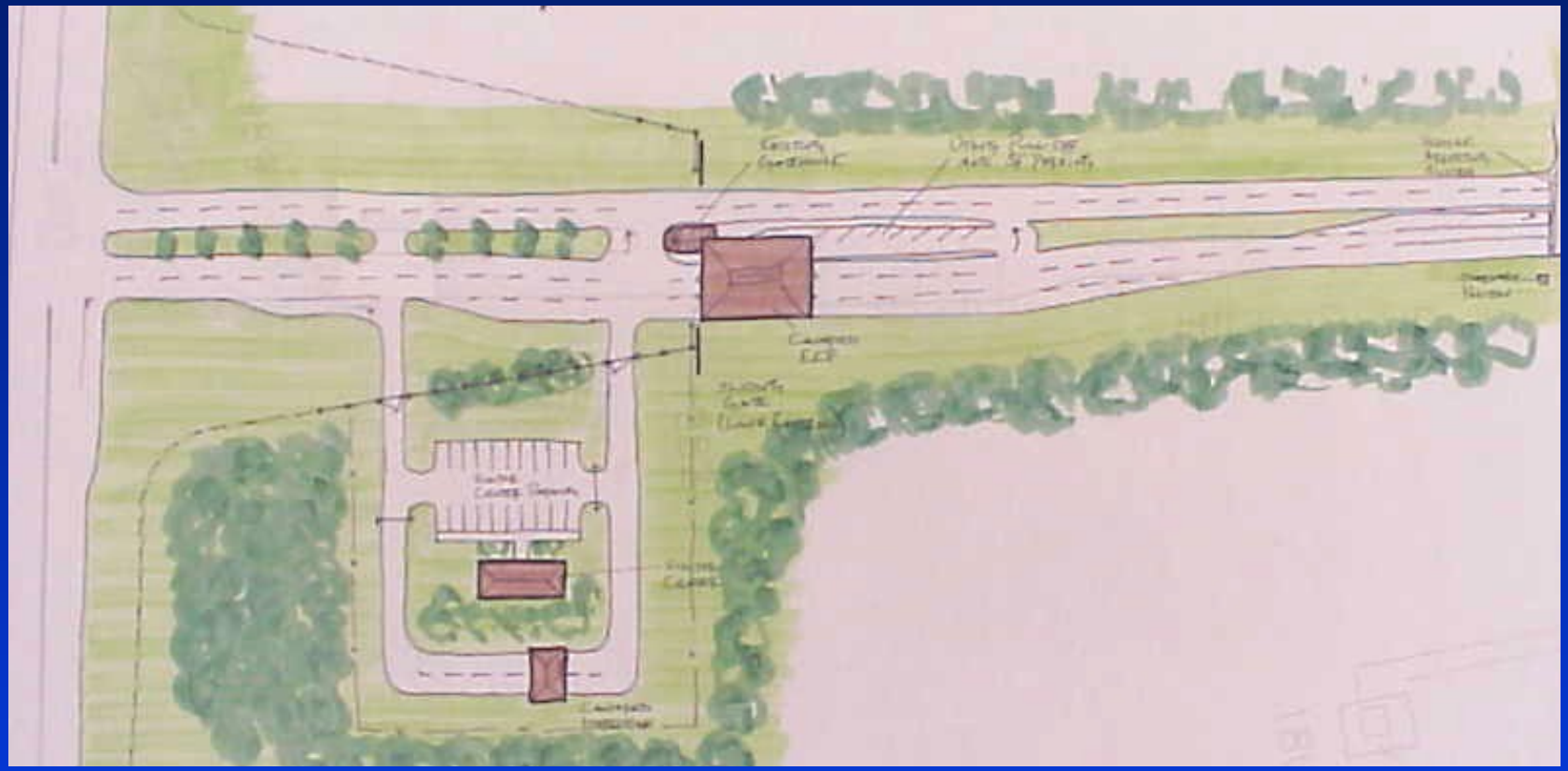
Design
Detail - Speed Control at ECFs

- **Chicanes**
  - Similar technique to off-set Jersey barriers, but safer
  - Slows vehicles by forcing them to shift directions
  - Proper design required





Design
Integration of Design Requirements - Example



Design
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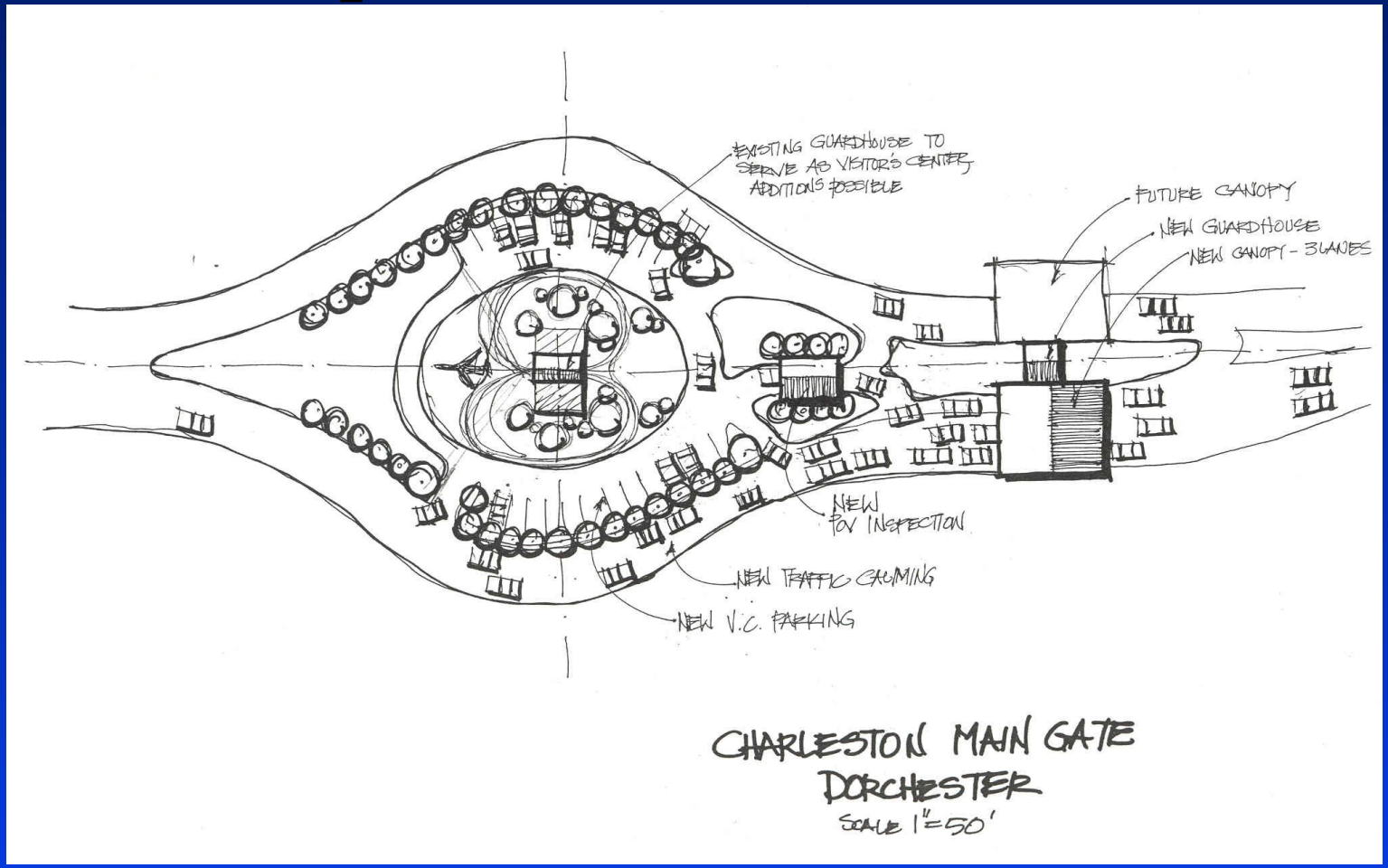

Design
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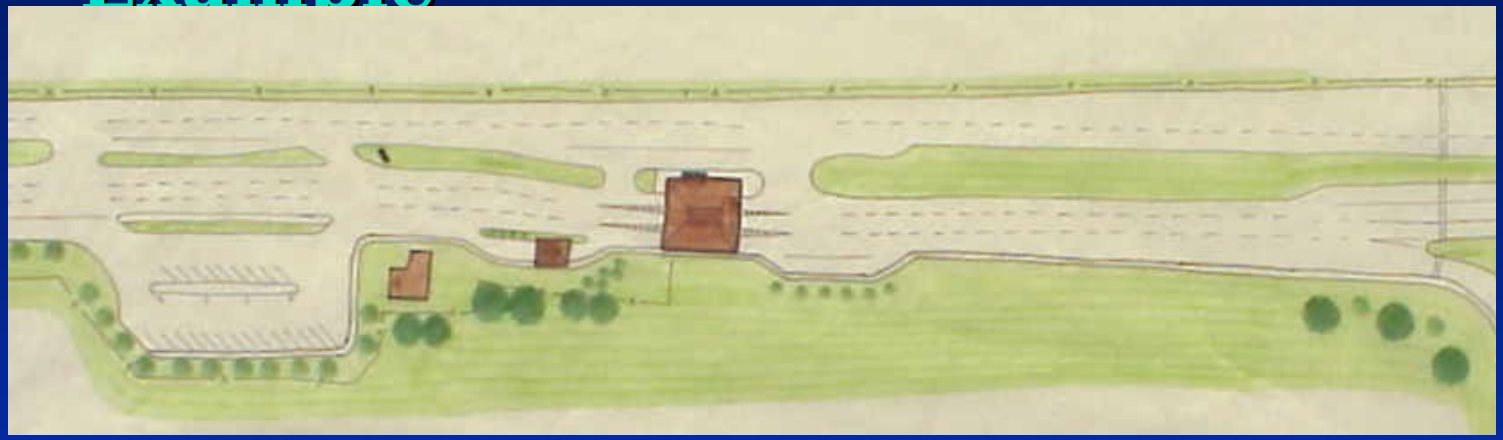

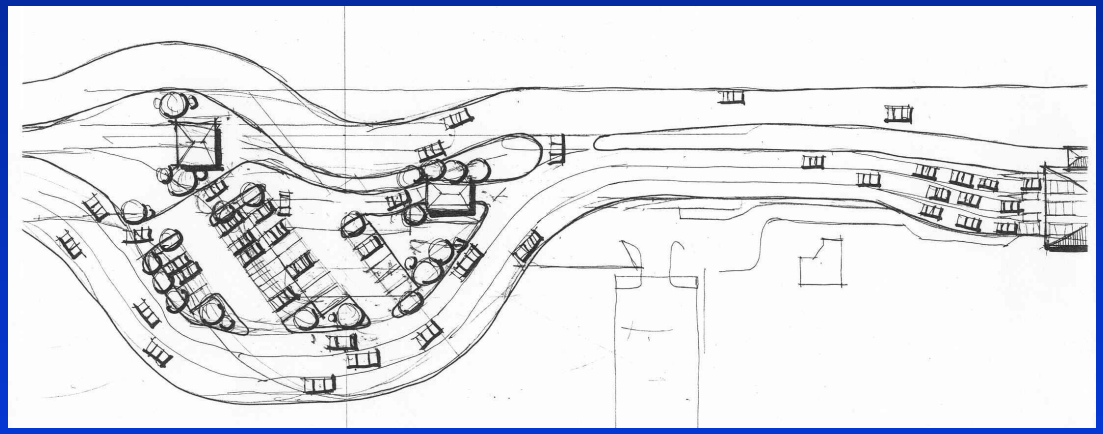

Design
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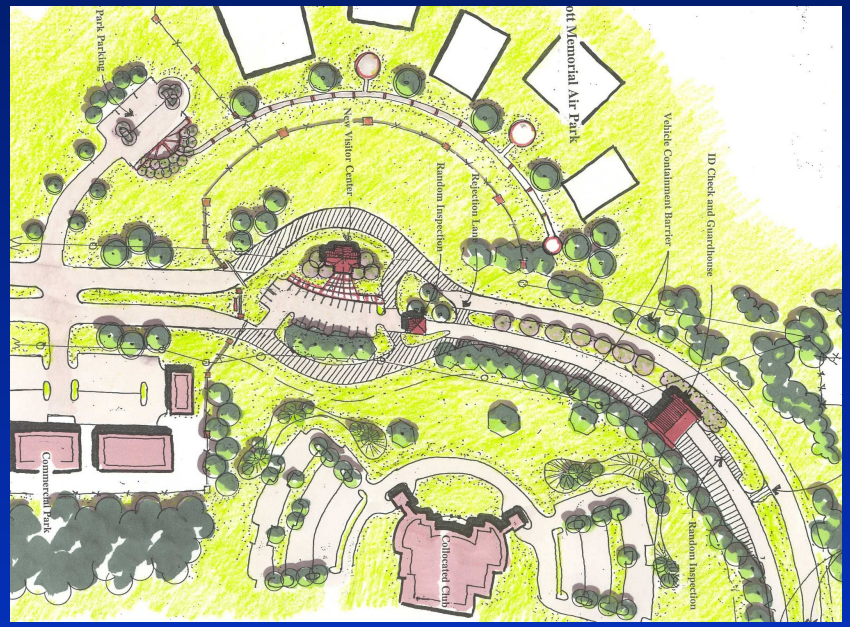

Design Build+
AMC Plan

- Use DB+ to complete design and build ECFs
- Six cold weather gates first
- Use year end fallout for warm weather gates
- Use component structuring for program and funding
- Approximately $1.5 to $5 million per installation
- 4 to 6 month construction
- Design Build Contracts transferred from AFCEE to installations once initiated
- Phasing per installation to manage traffic and security

Built
Constructed – McChord AFB, WA